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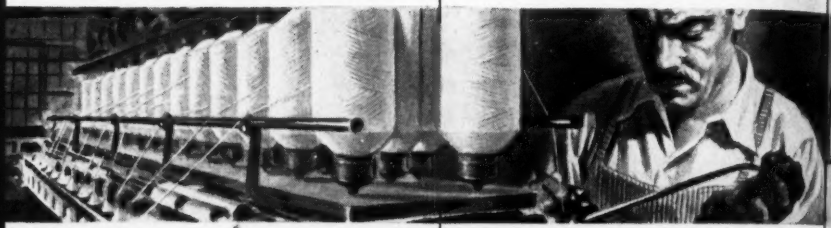

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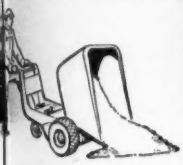

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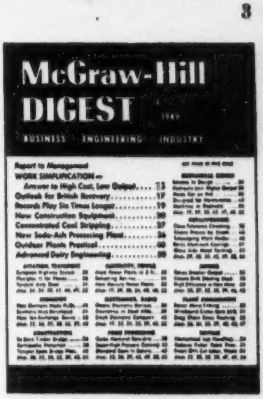

MAY, 1949
VOLUME 4
NUMBER 5

Member — Audit Bureau of Circulation

McGraw-Hill Digest is published monthly by McGraw-Hill International Corp. for circulation in all countries except the United States and Canada. Publication and executive offices, 330 W. 42nd St., New York 18, N. Y., U.S.A. James H. McGraw, Jr., President; Eugene P. Warner, Vice-President and General Manager; James L. Gilbert, Senior Vice-President; John F. Chapman, Vice-President; George Quisenberry, Vice-President; Curtis W. McGraw, Treasurer; Joseph A. Gerardi, Secretary; J. Clifford Stark, Assistant to President; K. Presbrey Bliss, Vice-President and Director of Advertising; J. E. Blackburn, Director of Circulation. *Subscriptions may be ordered through Director of Circulation, through local book dealer, or McGraw-Hill, Aldwych House, London, W. C. 2 (British only.)* Subscription rates: $5 for 1 year, $8 for 2 years, or $10 for 3 years; single copy, 50¢ (U. S. currency). Entered as second-class matter December 17, 1947, at the post office at New York, New York, under the Act of March 3, 1879.

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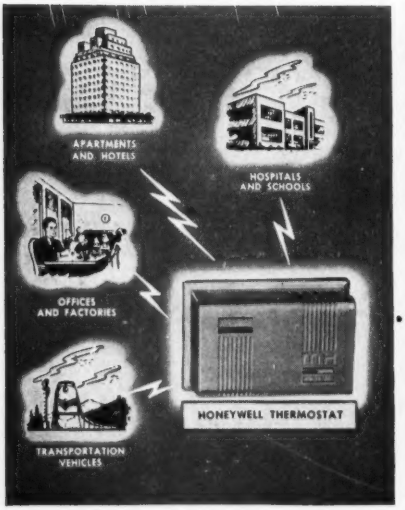

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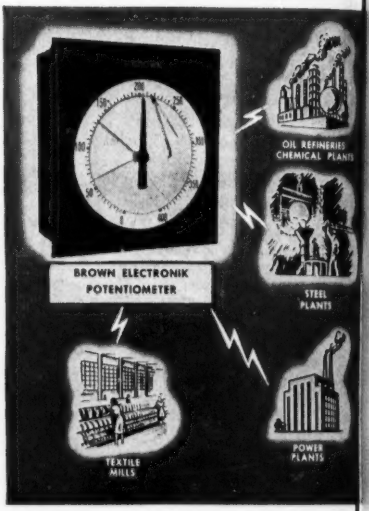

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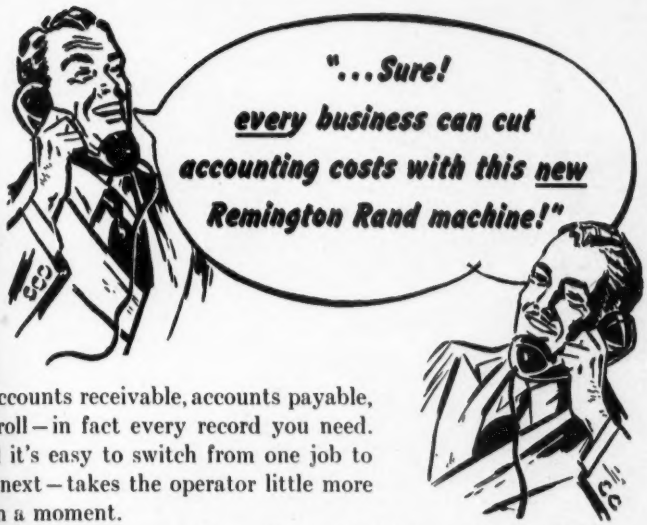

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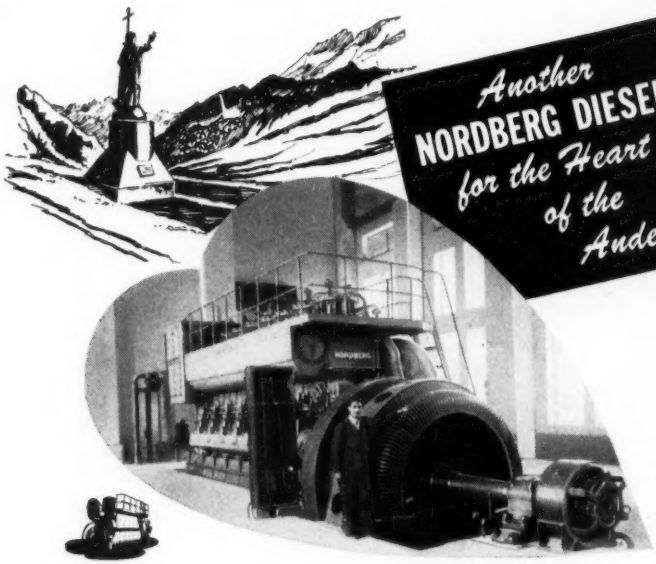

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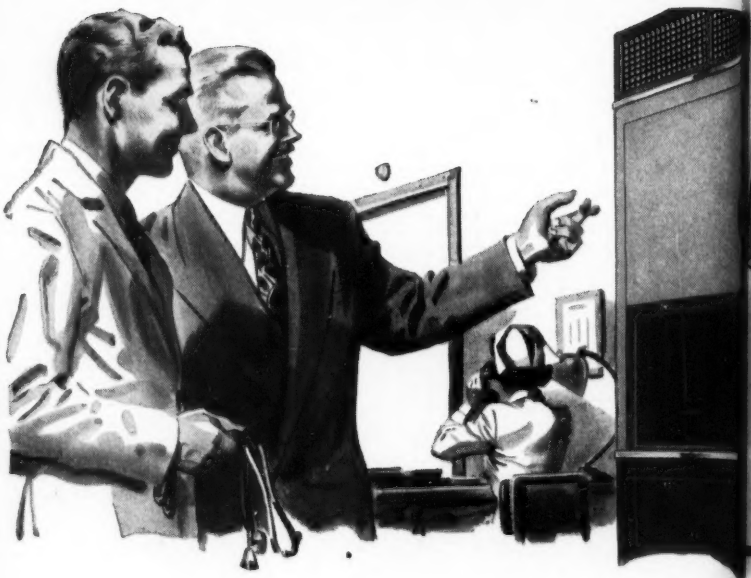

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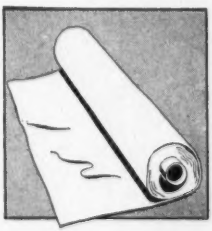

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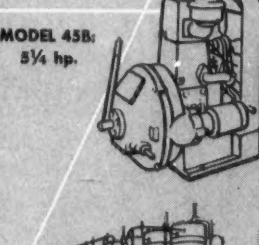

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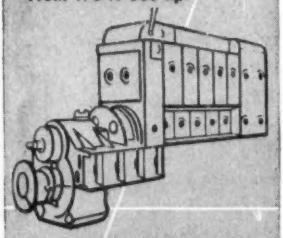

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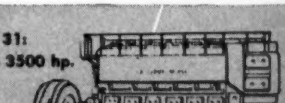

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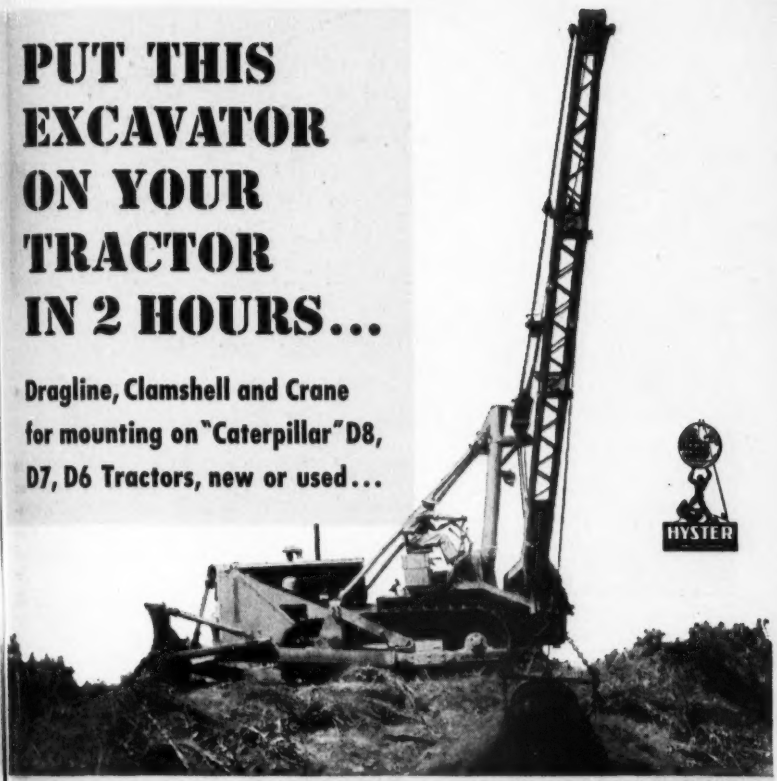

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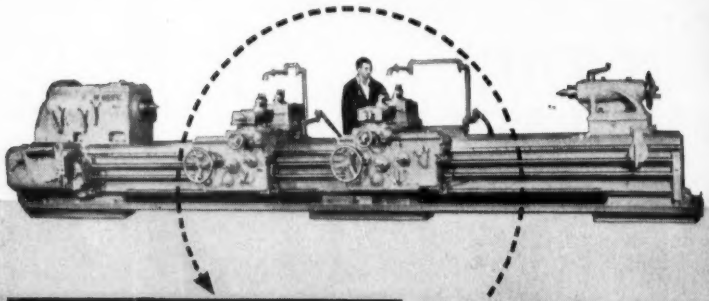

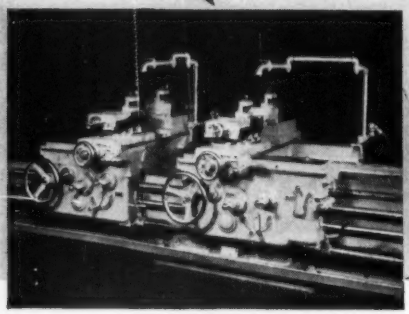

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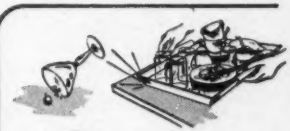

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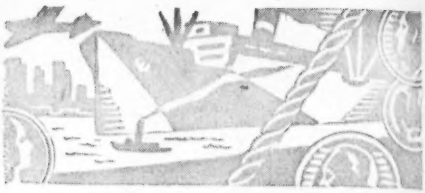

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Calcutta

Japan
Tokyo
Osaka
Yokohama

Mexico
Mexico City

Peru
Lima

Philippines
Manila
Port Area
Cebu
Clark Field

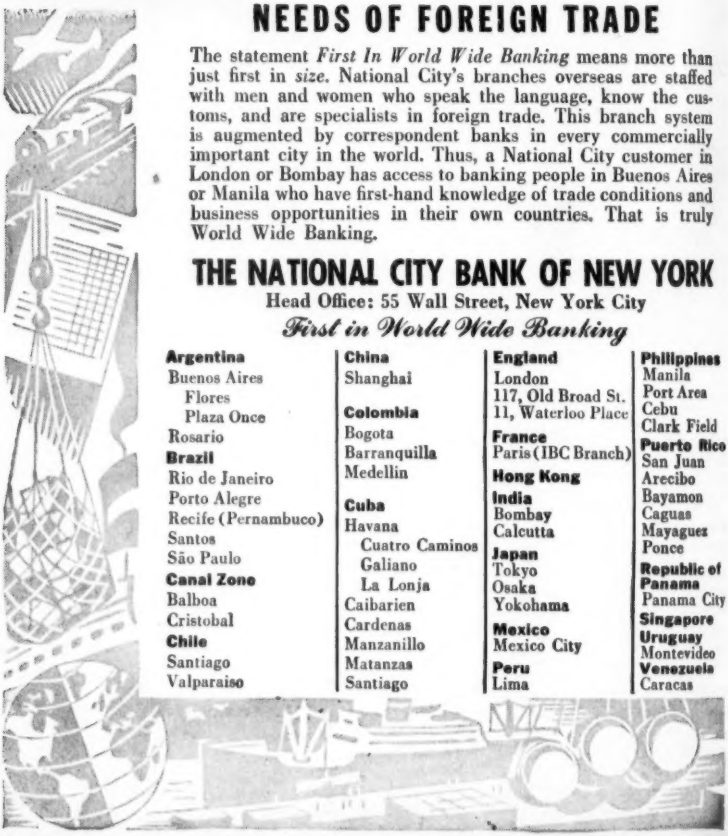
Puerto Rico
San Juan
Arecibo
Bayamon
Caguas
Mayaguez
Ponce

Republic of Panama
Panama City

Singapore

Uruguay
Montevideo

Venezuela
Caracas



Business Trends

BUSINESS CONDITIONS IN EUROPE are in a worrisome state of transition. Practically overnight the problem of increasing industrial production has changed to a marketing problem—where to sell exports, how to expand distribution so the looming threat of overproduction will not be realized.

British business is an example of this sudden change. The cabinet, for instance, is divided on whether inflation or deflation is more to be feared for the rest of this year. Aneurin Bevan thinks signs of a drop in consumer demand foreshadow a depression. Sir Stafford Cripps believes the opposite—still wants a heavy budget surplus, large exports, and home consumption held down.

Signs of readjustment in Britain are evident: sharp drops in retail profits; shorter workweek in tractor manufacturing; textiles made for export piling up in warehouses; British automobile manufacturers asking government permission to sell more at home because of sales resistance abroad. Another sign—reports from Britain tell of no rush on clothing stores when clothing rationing, after 8 years, was lifted in middle March.

Trade wise, Britain fared not too badly in 1948 and expects a lower deficit in 1949. World-trade deficit in '48 was $1-billion. Forecasted for the first 6 months of '49 is a $60-million deficit. But the same trouble will be met this year. Few British exports will earn hard currencies. Last year, the net drain on gold and dollar reserves was $1.7-billion.

Conditions in France are at last promising. Policies of the Third Force government are lowering prices, installing confidence in the franc, defeating inflation—if now the correction does not go too far in the opposite direction. The 5% national loan was a success. Industrial production is satisfactory, now running for a year at over prewar levels.

In France, as in Britain and other European countries, the important external problem is how to reduce the trade deficit. In January, France covered only 61% of its imports with exports; only 8½% of imports was covered by trade with the dollar area—the worst month since 1947. So in western Europe, look for these steps to be taken:

(1) Frantic export drives, particularly for dollars.

(2) Reduction in imports from dollar areas as far as practical, subject to maintenance of a high level of economic activity and acceptable living standards.

(3) Strong opposition to any U. S. efforts to dump commodity surpluses through the European Recovery Program and to reduce dollar earnings of their merchant marines by retention and broadening of the ECA 50% clause.

(4) Less enthusiasm in OEEC for long-range production planning.

(5) Requests for U. S. aid, under the potential world-development program, to build up colonial territories.

Business Trends (Continued)

WIDESPREAD UNEMPLOYMENT may soon become a world problem that will have to be faced with the same vigor that pushed reconstruction successfully. At the moment, it is too early to tell exactly what may happen the rest of this year.

In the U. S., late March unemployment was 3½-million. Government labor experts predict that it will go little, if any, higher in '49 and that employment, currently at 57-million, will probably top the 60-million mark in July. Seasonal upswing in April is expected to show that current unemployment is only seasonal plus the irreducible minimum.

In Europe, the unemployment situation varies widely by country. Britain at year's end had only 1½% out of work, Belgium 13.4%, Denmark 11.6% (up from 4.2% during '48). France, Italy, Poland, and western Germany all had more jobless. Other parts of the world had their unemployed. Hawaii, for one, in March had about 10,500 out of work, a total of 7.9% of the labor force.

NOTES ON WORLD BUSINESS AND COMMERCE:

Norway is now assured of more steel for its shipbuilding program. It will get more than a third of the 161,870 tons of steel to be supplied to ERP countries in the May-September period. U. S. State Department wanted 300,000 tons for Norway, but Dept. of Commerce and steel industry opposed that amount.

Egypt, Ugandi, and the Sudan will benefit by development of one of Africa's most backward areas if plans to build a new dam and power house at Owens Falls on the White Nile are carried through. This $48-million scheme would bring several million more acres under irrigation.

India is pressing the establishment of a large-scale synthetic dye plant in the Damodar valley. A preliminary report has been finished by two German experts. Representatives of the Czechoslavakian national chemical works and an Italian firm also are being invited to submit proposals leading to project surveys.

Austria has announced successful completion of negotiations between Steyr-Daimler-Puch A. G. and the Italian Fiat automobile company for Austrian assembly of Fiats. Production will begin this summer at a rate of 2,000 cars per year.

Mexico will complete all paving this year on the Mexican part of the Pan American Highway. Although now passable, a 25-mile stretch north of the Guatemalan border is still unpaved.

Japan on a self-supporting basis by 1953 is called for by present plans of the Supreme Commander for the Allied Forces (SCAP). This will be done by (1) pushing exports and bringing balance to Japan's international payments and (2) making effective use of internal assets and relief supplies. Achievement depends on trade expansion within Asia, direct participation in foreign trade, economic stabilization, rigid allocation control, and managerial reform.

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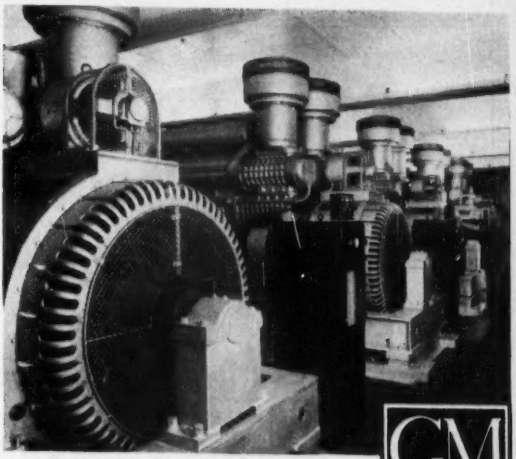

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Washington Report

IS ARGENTINA RETURNING TO PRIVATE TRADING? Washington sees signs that she is. The shakeup which toppled economics Boss Miranda and Central Bank President Maroglio has been followed by decrees stripping the Argentine Trade Promotion Institute of important functions; IAPI has completely controlled Peron's foreign trade up to now.

Under the new regime, exports of such items as wool, dairy products, fresh fruits, and manufactured goods apparently return to private trade; IAPI will still control the sale abroad of Argentina's main farm products—cereals, fats, oil. In the case of imports, IAPI will limit itself to products "difficult to handle commercially"—rubber, oil, coal, tinplate.

Peron hasn't relaxed his state trading activities because he wanted to. He was driven to it by: (1) IAPI's wasteful importing practices which over the last two years drained Argentina's gold and dollar reserves; (2) threat of an army coup d'etat unless Miranda and Maroglio were ousted; and (3) need to do something about the $250-million Argentina owes U. S. exporters for goods delivered.

If Peron really follows through on these reforms, there is a good chance that he will get a credit of between $100- and $200-million jointly from the Export-Import Bank of Washington and U. S. private banks. That would pay off the bulk of Argentina's commercial arrears, get trade with the U. S. moving again.

GERMAN INDUSTRIAL PRODUCTION HAS LEVELLED OFF at about 80% of the 1936 level, after an unbroken rise since last summer's currency reform. Present rate is an occupation peak and it looks like the top for a while. Big bottleneck now is electric power. To break through, the U. S. has sent a team of three top American power engineers to Germany to study the problem.

FIRST RE-ENTRY OF U. S. PRIVATE CAPITAL into the Mexican oil fields since the expropriation in 1938 has been negotiated. Petroleos Mexicanos (Pemex)—the Mexican oil monopoly—has contracted with a U. S. group formed by Edwin W. Pauley, Signal Oil Co., and American Independent Oil Co. which consists of nine independent operators. The group has been incorporated as Mexican American Independent Co. (CIMA).

Contract terms: CIMA will provide capital and technicians for exploration and drilling in the states of Tabasco and Vera Cruz. Pemex will reimburse CIMA for its costs out of 50% of the production and, in addition, will pay CIMA 15% of production as profit. There will be no payment for dry holes.

Most significant of all, Pemex will boss the job in compliance with Mexican law. This point has been the stumbling block upon which previous

Washington Report (Continued)

negotiations for return of U. S. oil companies to Mexican fields have fallen.

BIG ROLE FOR THE UNITED NATIONS is a certainty in President Truman's dramatic and far-reaching program for development of the under-industrialized areas of the world—the "point four" of his inaugural address (see p. 23, 25). Idea is that those already-functioning United Nations agencies expand their work—to become more or less subcontractors for the U. S. government.

Examples: Food & Agriculture Organization would transplant improved seed and advance farming methods. World Health Organization would introduce sanitary engineering and anti-epidemic practices. International Labor Organization would inventory technical skills, locate labor surplus and labor deficit areas.

In Truman's mind, these are the kinds of things that must be done to create a favorable climate for economic development; workers need to be well-fed and healthy before they can turn in a better day's work.

That's why Congress is being asked to remove the statutory ceilings on U. S. contributions to the UN specialized agencies.

U. S.-BUILT OIL LINE FROM THE PERSIAN GULF across the Saudi-Arabian desert to the Mediterranean is now certain to be completed. That's the significance of the government's release of 25,000 tons of steel pipe for the Trans-Arabian Pipe Line Co. project. Another 180,000 tons of pipe will be needed for the line.

Completion is scheduled for late 1950. After that, the line will carry 500,000 barrels of oil daily, most of it to Marshall Plan countries, eliminating present costly tanker transportation through the Suez Canal.

MANGANESE SHIPMENTS TO THE U. S. are being choked off by the Russians. Reason: to blackjack the U. S. into relaxing the present embargo on exports of machinery to the Soviets. First quarter, 1949, shipments of manganese from Russia were less than one-half the rate of the same quarter a year ago; furthermore, each 1949 month was lower than the preceding one.

The squeeze won't work. U. S. already is taking steps to expand alternative sources. Example: Allocation of American steel to build ore cars for the Union of South African Railways, to transport manganese-bearing ores from mines to tidewater. Further, U. S. stocks of manganese, together with non-Russian production, are enough to keep the steel industry going full blast for two or three years.

BUENOS AIRES CONFERENCE—economic follow-up to the Pan-American meeting at Bogota—has been postponed until "sometime late in '49." Preparatory work for the scheduled spring session fell way behind but, more important, government officials feared they would be swamped with requests for aid under President Truman's "point four" proposal.

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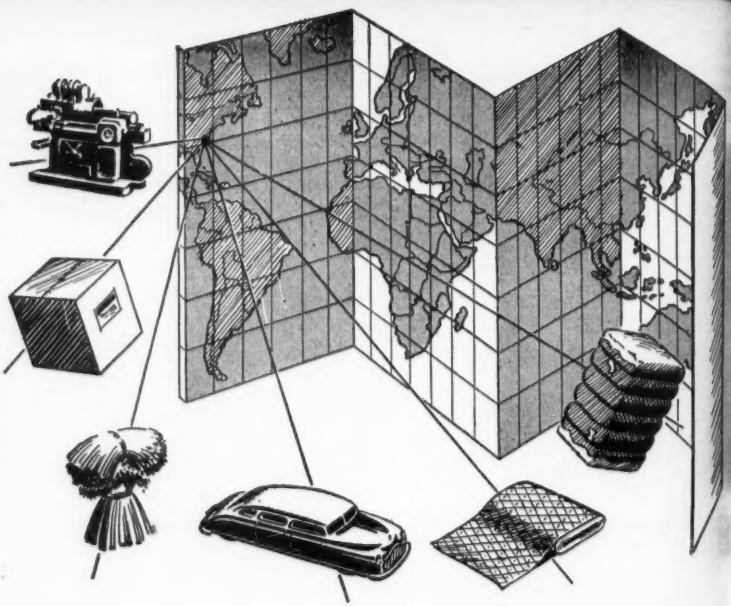

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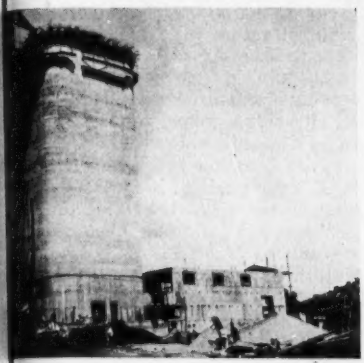
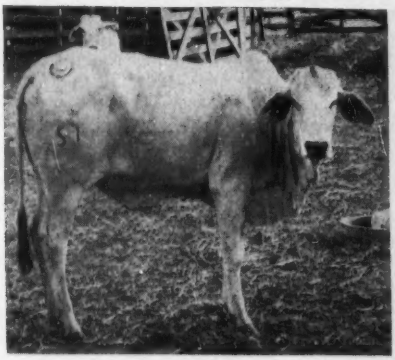


New Cattle Breeds—part of . . .



BEC Goals in Latin America

Builders of grain elevators, growers of hybrid seed corn, modern cavalrymen of mechanized farming — these are the ambassadors of IBEC

OUTH AMERICA is watching closely a mance in private enterprise—an inter-ional merger of U. S. private capital d technical knowledge with the oppor-nities afforded by under-industrialized ntries.

The development organization is the ternational Basic Economy Corp., nded only a short 2 years ago by son A. Rockefeller, bearer of a name g familiar in international oil financ-. IBEC and its affiliate, Venezuela ic Economy Corp., have spark-gged, on a partnership capital basis, w enterprises in agriculture and allied ds in Brazil and Venezuela.

IBEC is not a philanthropic organiza-on, nor is it a plaything of American illionaires. It is intended to serve, at a rofit, as a channel for the transmission broad of capital, technology, and man-gerial experience and to mingle these in rtnership with similar and natural al resources. In Mr. Rockefeller's rds, it was founded on:

"... a desire . . . to promote the economic development of various parts of the world to increase the production and availability of goods, things, and services useful to the lives or livelihood of their peoples, and thus to better their standards of living..."

It is obvious that fulfillment of this objective depends to a major extent on the care and effort going into the selection and operation of enterprises. So IBEC policy is first to study the over-all economy and determine the economic bottlenecks that are holding back sound development.

Enterprises are then established under capable management to produce the goods and services needed in breaking these bottlenecks. Such enterprises should offer investment opportunities yielding reasonable return and capital appreciation, and at the same time contribute to lower production and distribution costs to consumers.

Financial participation by nationals of the country concerned is encouraged, and local nationals are employed and trained

for technical and managerial posts. Participation by U. S. companies in contributing technical knoweldge is especially welcomed.

In Venezuela, VBEC enterprises have been financed jointly by VBEC, oil companies operating in Venezuela, and Corporacion Venezolana de Fomento (government developing agency). Their goal has been the reduction of food costs to Venezuelan consumers.

The quickest way to improve the food situation seemed to be development of a commercial fishing enterprise, Pesquerias Caribe, C.A. As refrigeration was strange to Venezuelan fisherman, the first step was to start building a refrigerated fish storage plant at Puerto La Cruz. Now PCCA also operates a small fleet, buys fish from independent fishermen, provides them with ice and equipment, and retails fish in Caracas.

A farm company—Productora Agropecuaria, C.A.—was organized to produce food by modern techniques. PACA is operating three large agricultural and livestock projects and a poultry project. Pure-bred cattle were imported from Texas and cross bred with local stock.

Staples are going to market in increasing quantities, distribution being carried on by still a third VBEC company—Distribuidora de Alimentos, C.A. This firm also handles products from other Venezuelan sources and has organized the warehouses, cold-storage plants, and retail outlets leading to an efficient operation.

IBEC in Brazil

In its Brazilian operation, IBEC realized that perhaps the most important factor to Brazil's future was industrialization but that basic industrial development depended on modernization and mechanization of agriculture on a sound business basis.

Five IBEC enterprises are now developing in Brazil: S.A. Fomento Agro-Pecuario operates hog farms in State of Sao Paulo. Sementes Agroceres S.A. produces and markets hybrid seed cor
Cargill Agricola e Comercial S.A.
joint enterprise with Cargill, Inc., a U.S
grain company—has built the first tw
grain elevators in Brazil. Empresa d
Mecanizacao Agricola S.A. has thre
units equipped with modern machinery t
provide mechanized agricultural service
for Brazilian farmers. The fifth com
pany, Combate a Pragas Helicop Ltda.
does crop dusting with helicopters.

All these projects in Brazil and Vene
zuela demonstrate the value of moder
techniques in bringing about increase
production. It is IBEC's belief and hop
that their successful operation will en
courage other groups to undertak
similar work and thus expand ultimat
benefits to the nations' economies.

Zones of IBEC Interest

Plan Aids World Development

Pennsalt International Corp.'s plan for exchange of American technical know-how to implement President Truman's plan for under-developed countries

EXCHANGE OF AMERICAN technology under President Truman's "point four" for the industrial development of the underdeveloped countries of the world — as expressed in the President's inaugural address—is being implemented by Pennsalt International Corp.'s plan for international exchange of technical know-how.

As previously announced (see McG-H Digest, Apr, p22), Pennsalt has made available to Imperial Smelting Co., Ltd., England, and to Societe D'Electro-Chemil, France, its manufacturing methods for basic fluorine and sodium subsilicates respectively.

Since these negotiations were completed, the company has entered negotiations with chemical companies in Brazil, Egypt, India, Mexico, and South Africa. Under the company's plan, Pennsalt will extend the technological assistance necessary to rehabilitate the country's chemical industries if destroyed by war or to develop new industries in a country to better exploit that country's resources.

To Build New Industries

Ultimate purpose of the plan is to bring into existence new chemical industries throughout the world—industries fully integrated as to raw materials, manufacturing facilities, distribution systems, and markets.

The plan is being financed in one of three ways, the payments made by the client company going to Pennsalt for deferment of the original development costs. Methods of payment are:

1. Payment of a flat sum for know-how supplied to the client.
2. Payment of royalties on the products manufactured and sold by the client.
3. Payment of a share of the client's profits.

During the initial stages of the program, Pennsalt will give the client company detailed assistance—both commercial and technical—in the best methods for manufacture and distribution of the product. When markets and distribution facilities have been established to the satisfaction of the client, Pennsalt will deliver the technical details of plant construction and manufacturing processes. Pennsalt engineers will assist in the design and construction of the plant and will remain to put manufacturing on a stable footing.

Survey Precedes Plant

If surveys of markets and distribution indicate that an immediate need for finished products exists, even before manufacturing facilities can be put into operation, the company will supply those finished products so that the client may satisfy demand until he gets into production. Raw materials will be supplied by Pennsalt until natural resources of the country can be developed to a point where the plant may become self-sufficient.

The plan will work also in reverse. Should client plants develop new manufacturing shortcuts, those manufacturing details will be made available for Pennsalt's domestic manufacturing operation.

There is no time limit in which the client company must assume complete control of the operation. Engineers will remain on the job until the client is satisfied that operation is progressing smoothly . . . months or years.

The only restrictions that the program permits are those restrictions imposed by the Commerce Dept.'s Office of International Trade and those defined by patent laws of the client's country. Thus more than one manufacturer may take advantage of the Pennsalt plan in the same country.

Report Charts Brazil's Future

Only by joint development of both industry and agriculture can Brazil hope to succeed in its plan for development; committee recommendations listed

ONE UNDER-DEVELOPED COUNTRY—Brazil—got a headstart on President Truman's plan for development of under-developed countries with the publication of the report of the Joint Brazil-United States Technical Commission (see McG-H Digest, Dec '48, p24). Committees were headed by Mr. John Abbink, former chairman of the board of McGraw-Hill International Corp. and Dr. Octavio Gouvea de Bulhoes. Most hopeful sign is that it is truly a "joint" report.

The report has now been passed to U. S. agencies for study and recommendations: to Treasury Dept. for possible tax conventions; to Agriculture Dept. for advice on technical collaboration with Brazil's Ministry of Agriculture; to the Export-Import Bank and World Bank for possible loans.

The report stresses the fact that agricultural and technical development of the country must progress together. One cannot make progress without progress by the other. A more productive agricultural economy will supply the needed raw materials for industry, more labor for industry, and a larger home market for products of industry.

With Brazil's trade balance badly out of line, the report recommends that present restrictions on importation of hard-to-get items remain in force to protect gold and foreign-exchange reserves. Devaluation of the cruzeiro was not recommended as a stimulant to increased exports.

For major development of industry, Brazil must develop dependable sources of fuel and power, a more efficient transportation system, additional skilled labor, more technical and managerial personnel. Agriculture needs better tools, more fertilizer, better transportation, and storage facilities.

Financing Development

The joint committee recommends:

(1) Increased tax revenues with reforms in the current tax system.

(2) Use of domestic funds for education, health and agricultural development. Foreign capital to carry the burden of development of industry and mineral deposits.

(3) Establishing a securities and exchange commission to strengthen private securities.

(4) Prompt payment for imports to better credit position.

(5) Granting of inducements to "favored" investments.

(6) Guarantees to private investors of convertibility from cruzeiros to dollars.

(7) Consideration by the U. S. of a reduction in taxation of income derived from under-developed areas.

• By industry the report pictures the Brazilian scene as follows:

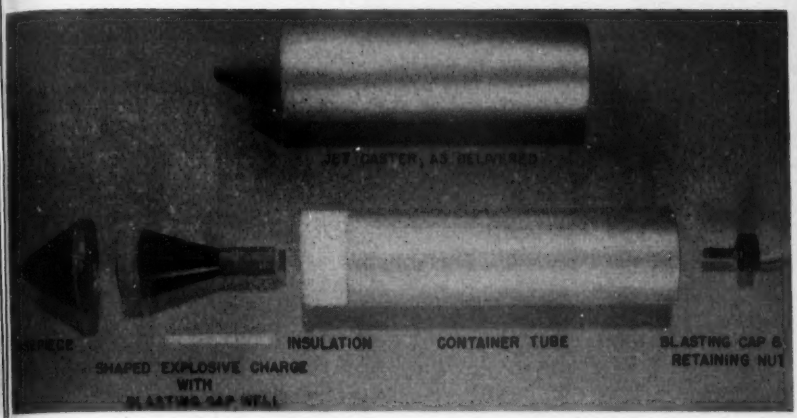
Agriculture—Trained personnel is needed. Technical knowledge of soil conservation, fertilizers, insect control, and mechanization must be imported.

Transportation—Railroads, highways, airlanes, rivers, and coastal waters must be considered together. The multi-gage system of railroads must be unified.

Industrial Development—Practice of high profits from a limited market instead of a smaller profit from a large market has retarded development.

Fuel and Power—Wood is now the country's major source of fuel. Coal present is of poor quality, but could be improved by modern cleaning methods. Production would benefit by mechanization of mines. More hydroelectric capacity is needed.

Mining—Large deposits of minerals, iron ore and manganese included, are present but must be developed. The inaccessible location of deposits demands an integrated transportation system.



JET CASTER is made of a sheet-metal shell containing a shaped explosive charge (1½ or 2 oz.), insulation, and blasting cap; dimensions vary according to use

Speeds Steel-Furnace Tapping

New device, jet caster, for opening tapholes in blast furnaces and other furnaces, promises to overcome disadvantages of oxygen lance

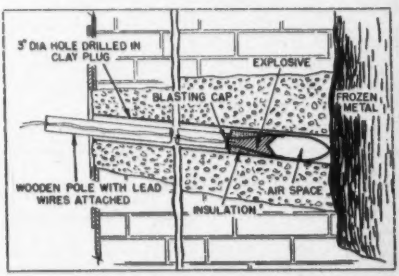
JET CASTING brings a full flow of hot metal from a blast furnace or openhearth, reduces casting time, provides uniform taps, and adds to worker safety. Experimental work has been carried on at Republic Steel Corp. by Arthur D. Little, Inc., and Du Pont.

This new method (see McG-H Digest, Mar, p36) employs a shaped or hollow explosive charge called a jet caster. It focuses the energy of a small amount of explosive to punch a hole through the crust of a taphole.

The caster, made of light-gage sheet metal, is 2½ in. in dia. and 10 in. long. Its 2 oz. of explosive, ample to make a 2-in. hole through 8 in. of cold cast iron, has a penetrating force of 5-million psi. The charge is detonated with a blasting cap. For openhearths, charge is 1½ oz.

In 20 consecutive experimental casts, 18 were successful, one failed to open the hole, and one partially opened it. No damage to the hole was observed, and casts were easily controlled. Full iron flow was available immediately, filling the trough in 30 sec. Tonnage was more uniform than with oxygen lancing.

In openhearth tapping, more careful



TAPHOLE is drilled out in usual manner, jet caster is placed against blastfurnace iron notch with a wooden pole, and charge is fired by blasting machine

preparation of taphole is necessary. The dolomite plug must be raked out as far back as the burned crust to accommodate the larger-diameter (3½ x 9-in.) jet caster.

An important advantage of jet casting is that there is no chance of misfire while assemblying, handling, or placing the caster in the iron notch. The operator merely attaches the caster to a wooden pole long enough to place the nose of the shell against the skull. He then connects wires to the blasting machine and depresses the plunger to detonate the charge.

The caster has a 3½-in. insulation, which prevents the charge from melting in less than 3 min. This is ample time to place and fire the charge. Should the caster fail to explode, taphole heat sets off the cap eventually but not the charge which "cooks off" in about 7 min.—Iron Age, Feb 17, p85; Steel, Feb 21, p108

Interline Bills on Microfilm

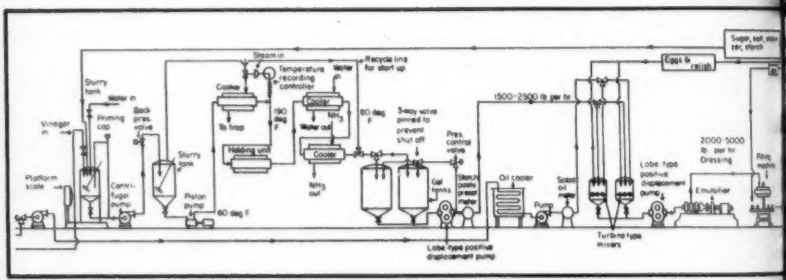
Accounting department of Greyhound bus lines is using microfilm to reproduce interline billings. The photographic process has reduced manual operations as much as 90% in some cases and has c billing time proportionally. It also giv billing carriers a complete record a virtually eliminates transcription erro Records needed for Interstate Comme Commission are reduced in bulk to co pact rolls of film.—Bus Trans, Mar, p

Gravity Meter Ore Surveys

Although used frequently for petrole surveys, gravity meters rarely have be used in ore surveys. The U. S. Bure of Mines made a gravity-meter surv recently in New Mexico to prove h successful the instrument can be f commercial mining operations. The vice was used only after other survey methods had been given up.

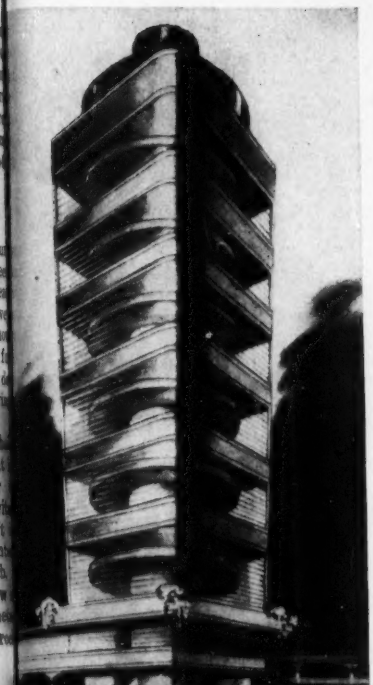
The meter is essentially a spring b ance with a weight attached. Weight calibrated by measuring how far stretches the spring—how much gravi tional pull is exerted on weight. It about 1 ft. by 8 by 10 in. and is moun on a tripod. It weighs less than 25 lb.

In mineral searches, a high or a low sought, depending on whether the me sought is heavier or lighter than ro with it.—Eng & Min J, Mar, p52



CONTINUOUS PROCESSING ON MULTI-PRODUCT LINE

Durkee Famous Foods makes salad dressing, mayonnaise, and sandwich spread on one production line. Oil and vinegar are fed from storage to a slurry tank where starch, stabilizer, salt, and sugar are added. Mixture is pumped to second slurry tank and fed continuously through starch-paste cooker and cooler. Paste next flows into gelling tank Paste and oil are metered to premixers a blended with eggs and spice oils. Mixing completed in the emulsifier to stabilize the further and produce smooth-textured pro ucts. Dressings are then delivered to th packaging line.—Food Ind, Mar, p69, 124



TH FLOORS cantilevered out from a
ntral trunk, S. C. Johnson & Sons' wax
search . . .

ab Built Like a Tree

ew 13-story building, designed by
rank Lloyd Wright, segregates research
partments vertically rather than hori-
ntally. The "trunk," a circular
asonry column, extends 50 ft. into the
round. Six floors are circular—38 ft.
ia.—and are glass-inclosed within the
uare walls. The latter walls are of
rizontal glass tubes.

Trunk contains elevator; heating, ven-
ating, and air-conditioning ducts;
airway; piping; and other service facil-
es. Circular construction permits con-
centration of service facilities, reducing installation and service problems, and facilitates inter-floor communication by placing labs directly under each other. Alternating round and square floor provides maximum natural light for research.—Business Week, Feb 26, p53

Trend to Finer-Denier Hose Means Closer Tension Control

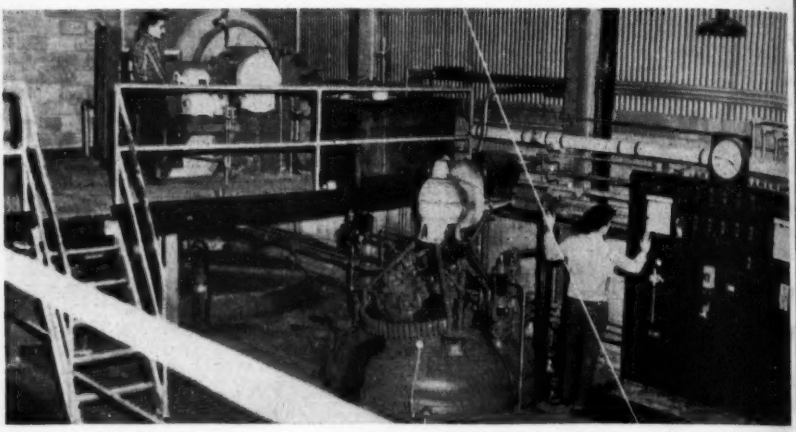
Trend to finer-denier yarns and higher-speed machinery in full-fashioned hosiery knitting makes yarn tension doubly important if quality and production are to remain high. Winding of yarn on cone must be kept even as tight or loose yarn on cone increases or decreases tension during knitting.

Felts must not remain too long in troughs as they become hard and sticky. They should be changed at least every 3 months. Tension rings and wires must be clean to permit yarn to slide freely up and down wires. Stainless-steel rings are superior to standard brass rings, especially when working 15-den. yarns.

Some mills are still knitting 15-den. yarn directly off pirn. The 15-den. yarn that is thrown, sized, and coned probably has more advantage than that directly from pirn in controlling hose length on machines. On Reading machines, pirn is set at an angle to machines to let yarn reel off more easily. Yarn is run through a moistening box, tension ring, and over bottom snapper rod. On Kalio knitters, pirn need not be set at an angle to the machine.—Textile World, Mar, p111

New Rocket Fuel Developed

Ohio State University needs a rocket ship to burn its new rocket fuel developed in its Cryogenic laboratory. Using liquid hydrogen cooled to —423°F., the fuel generates an exhaust which travels at a speed of 15,000 mph. The laboratory has built a motor the size of your hand to burn the fuel.—Science Ill, Apr, p16



HEART OF THE PROCESS is the main reactor in which FeSO, ZnO, and Cl_2 react to form three products—$ZnSO_4$ $ZnCl_2$, and $Fe(OH)_3$

Profits from Pickle Liquor

Disposal of spent pickle liquor from cleaning steel can be a costly nuisance. Here is how one company has turned the nuisance to profits

ALMOST ALL STEEL MILLS have a pickle-liquor disposal problem. When steel pipe is cleaned in sulphuric acid prior to galvanizing, some iron is dissolved. The resulting ferrous-sulphate solution is difficult to dispose of because of its pollution of streams.

The conventional method is to neutralize the spent pickle liquor with lime, but this practice is costly. So the Wheatland Tube Co. has installed a new $500,000 processing plant that converts pickle liquor into three salable products—ferric hydrate, zinc sulphate, and zinc chloride.

Raw materials, besides pickle liquor, are chlorine, received in tank cars, and zinc waste, a byproduct of galvanizing steel pipe. As the zinc waste brings only a low price when sold, its processing makes the new method profitable.

First step is preparation of zinc oxide from zinc waste by crushing, screening out of metallic zinc, and kilning. The ZnO is then slurried for ease of distribution and charging to reactors. To avoid unnecessary evaporation, the oxide is slurried in a zinc salt solution rather than plain water.

Spent pickle liquor, which contains about 21% ferrous sulphate, is cleaned in two preliminary reactors. Enough zinc-oxide slurry is added to raise the pH, and air is sucked in to oxidize ferrous iron to ferric and produce a ferric hydrate floc. The floc collects the dirt and when filtered out leaves a clean solution of ferrous sulphate.

The sulphate, slurry, and chlorine are fed to the main reactor. After 3 hr. all iron is precipitated as ferric hydrate which is filtered, ground, dried, and stored. Principle uses of $Fe(OH)_3$ are as a pigment or gas absorbent.

Filtrate containing $ZnCl_2$ and $ZnSO_4$ is polished in a leaf filter, then evaporated. First effect of first double-effect evapora-

r takes out about 3 lb. of water per gal. f solution; the second effect crystallizes t almost all $ZnSO_4$. A horizontal filter moves and washes the $ZnSO_4$ crystals hich are dried before storage.

Filtrate from horizontal filter is passed rough a second evaporator to remove remaining traces of $ZnSO_4$. The re- ting solution is 70% $ZnCl_2$, which is ored for sale and shipment in drums d tank cars.—Chem Eng, Mar, p112, 14

Wood Waste, Resin Boards Work Like Real Lumber

umber of wood waste and thermosetting sins—that handle like standard lumber is being produced at the rate of 10,- 00 sq. ft. per day by four U. S. manu- facturers. Thirteen more plants are earing completion. The man-made umber is produced by the following rocesses:

1. Dry Process—dry powder resin and ry wood wastes.
2. Eastern Wet Process—liquid resin r varnish and dry wood waste.
3. Western Wet Progress—liquid resin nd wood waste combined in a wet slurry.

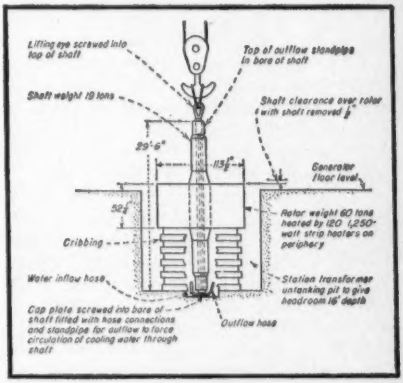
Both phenolic and urea resins can be sed in the dry and eastern wet process; nly phenolic can be used in the western et process. Bonding strength of urea ay be lower than that of phenolic when emperature and moisture are high. The ry process gives better uniformity with- in board than other processes.

In the dry process (probably the best for small-scale operations), wood waste must be uniform and moisture content must be kept to a predetermined content between 1–10%. Resin and waste are mixed in a bakery-type mixer. Mixture is laid on trays and cured under heat and pressure in a platen press. Platen press temperatures for boards containing up to 10% resin are between 300–350° F. with cycles between 8–15 min. for 1-in. board. Eastern wet process is similar to the dry process except that waste moisture content must be below 5%, percentage of resin is higher, and liquid resin is used. The western wet process varies widely from company to company.

The board takes enamel better than wood since there is no grain; harder surface does not dent, scratch, or mar easily. It can be worked as natural wood.—Mod Plastics, Feb, p59

South Africa Gets Solexol

The Solexol process, developed by M. W. Kellogg Co. (see McG-H Digest, Jan. '47, p6), has for the first time been commercially used in a fish-oil refining plant. User is the Marine Oil Refiners of Africa Ltd. at Simonstown, Union of South Africa. The process produces vitamin A concentrates from crude fish-liver oils. The plant can handle the Union's entire crude viamin A oil production.—Chem Eng, Feb, p217


Lifting eye screwed into top of shaft
Top of outflow standpipe in bore of shaft
Shaft weight 19 tons
Shaft clearance over rotor with shaft removed ½"
29'-6"
113½"
Generator floor level
52½"
Rotor weight 60 tons heated by 120 1,250-watt strip heaters on periphery
Cribbing
Water inflow hose
Station transformer untanking pit to give headroom 16' depth
Cap plate screwed into bore of shaft fitted with hose connections and standpipe for outflow to force circulation of cooling water through shaft
Outflow hose

EASES SHAFT REMOVAL

Southern California Edison Co. uses this simple method of vertical suspension of a large rotor by its shrink-fitted shaft for simple removal of the shaft. Rotor weight breaks fit after temperature gradient necessary for separation has been reached. Electric strip heaters (120 of them) supply heat. Shaft, 28 in. dia. is part of a 28,000-kw. horizontal hydrogenerator.—Elec World, Mar 12, p134

Materials-Handling Show Introduces New Equipment

The 1949 National Materials Handling Exposition featured exhibits by over 225 manufacturers. Shown for the first time was the new industrial-truck Dynatork drive developed by Clark Equipment Co. Power from truck's engine is transmitted by a magnetic induction drive that eliminates clutch, permits instantaneous reversal of direction, and increases maneuverability.

Another first was Yale & Towne Mfg. Co.'s gasoline fork trucks. The new line is powered with Chrysler engines and Fluid Drive units.

Several companies offered lightweight equipment for use in multi-story buildings. Among them were Automatic Transportation Co. and Baker-Raulang Co. Mercury Mfg. Co. exhibited its lightweight model A-560-5 tractor. Elwell-Parker Electric Co. showed its new 20,000-lb. hydraulic platform truck and Towmotor Corp. its hand pallet truck.

A new unit, exhibited by Hyster Co., combines a squeezing action in the horizontal plane with a rotating motion through a 186° arc in the vertical plane. Combined motions are for dumping.

Among new conveyors shown was a live-roller conveyor by Standard Conveyor Co. that is designed to prevent hand injury. American Monorail Co. showed a high-duty trolley with a floating-yolk saddle. American Chain and Cable Co. introduced a new line of Wright hoists. General Electric Co. exhibited an electric motor for conveyor drives, while Westinghouse Electric Corp. showed a truck control to protect motor from shock.—Am Mach, Jan 27, p269

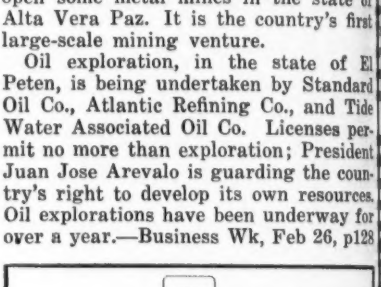
Alpeth—New Cable Sheath

Now in production by Western Electric Co., Alpeth is a composite covering of aluminum, water-resistant cement, and polyethylene for telephone cable. Inside layer of the sheathing is a transversely corrugated aluminum sheet around core. Cement is placed between the overlapped edges and then spread over the entire surface. Finally polyethylene is extruded over cement.—Railway Sig & Comm, Mar, p181

Seek Guatemalan Minerals

Petroleum, silver, lead, and zinc resources are drawing American capital into the jungles of Guatemala, primarily on an exploratory basis. Compania Minera de Guatemala has government sanction to open some metal mines in the state of Alta Vera Paz. It is the country's first large-scale mining venture.

Oil exploration, in the state of El Peten, is being undertaken by Standard Oil Co., Atlantic Refining Co., and Tide Water Associated Oil Co. Licenses permit no more than exploration; President Juan Jose Arevalo is guarding the country's right to develop its own resources. Oil explorations have been underway for over a year.—Business Wk, Feb 26, p128



SPEEDS OPENHEARTH CHARGING

Suggested modification of openhearth-furnace design has main roof between knuckles resting on skewbacks carried on plunger rods of hydraulic jacks. Roof section can be raised and furnace charged by tilting charging platforms. Auxiliary hoppers are for manganese, carbon, other materials. Furnace is tapped at bottom by combination stopper rod and drill inserted through roof immediately over tapping nozzle in hearth.—Steel, Jan 31, p68

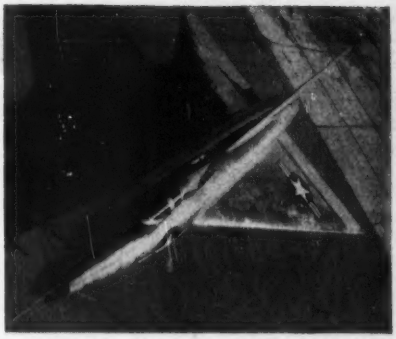
clone Furnaces Adapted Industrial Power Field

r Chemical Co. is pioneering in use of new "cylone" type boiler furnace in industrial power field. Two of these cock & Wilcox horizontal, cylindrical naces, of 8-ft. ID and 8-ft. effective gth, serve a boiler rated at 400,000 lb. team per hr. at ,250 psig. and 900° F. he cyclone furnace is formed by ely spaced pairs of watercooled tubes anged to form a cylinder. These ex- d into top and bottom headers con- ted to the boiler circulating system. he sides forming inside surface are ered with plastic chrome ore as a e for slag inclusion. The primary ner is at the inlet end of the furnace. Crushed (not pulverized) coal is fed to rnace in a high-velocity, tangential eam of preheated high-pressure imary air. Centrifugal force throws t relatively coarse coal particles and eds them in a thin layer of molten g that coats the inside of the furnace. here solid particles are burned by scrub- ng action of secondary air admitted ng furnace length.

Molten slag from combustion is con- nuously trapped to a slag pool under e boiler primary furnace from a hole in e end of the cyclone furnace. Gaseous mbustion products leave the cyclone rnace through a central re-entrant dis- arge throat that retains solid particles. —Power, Mar, p72

ashes Railway Cars

ilway cars of the Missouri-Pacific are shed in 2 min. by a train washer de- loped jointly by the line and the Penn- lvania Railroad. Cars move through sher at 90 ft. per min. Two sets of ft fiber brushes, revolving at 240 rpm., rab car. Jets apply detergent and ar water. Two hundred cars a day e handled by the 213-ft. long washing achine.—Railway Mech Eng, Mar, p134



A STUDY IN TRIANGLES

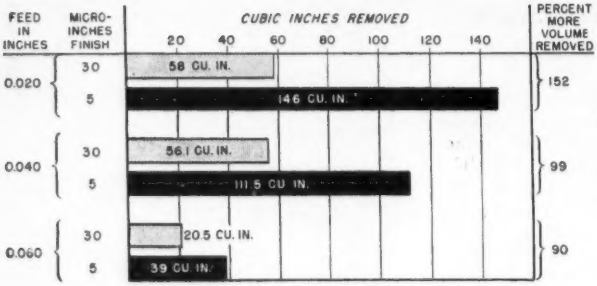
Convair's Deltawing Model 7002 is a model of the USAF's XF-92. Designed for an estimated top speed of 1,165 mph., it is powered by a ramjet engine with a series of ducted rocket motors for takeoff and acceleration. Sweep-back of 60° in leading edge will delay supersonic speed drag but offers considerable stability difficulties at low speeds.—Aviation Wk, Mar 7, p13; Mar 14, p16

Platform Speed Handling

A moveable platform at the loading dock of Beals, McCarthey & Rogers has eliminated the loading and unloading bottleneck in the cold finished steel warehouse. The 16 x 20-ft. platform can be elevated to a height of 5 ft., with push-button control of elevation at any height. Platform has a lifting capacity of 60,000 lb. It is raised by four oil hydraulic jacks powered by an electric pump. Platform can accommodate two trucks at a time; when not elevated it serves as a bridge into warehouse.—Ind Dist, Mar, p88

Improves Radiant Heating

An aluminum foil layer placed below heating pipes in the floor of a radiant-heated house in California has reduced heating time by five hours. Water pipes are laid atop a concrete slab and directly below wooden flooring.—Eng News-Rec, Mar 17, p20



LONG TOOL LIFE

Tests on lathe tools at Westinghouse Electric Corp. showed longer life with better surface finish, even with coarse feeds. Tools with 5-microinch finish were ground on Bud away grinder and lapped. Speed was 1 sfpm.; cut depth, in.; material, 0.45 carbon steel.—Ai Mach, Feb 24, p86

Multipurpose Radio Tube Developed in Great Britain

A British multipurpose radio tube, known as the Sargrove-Tungsram VA-55, can fill a number of applications. It resembles a beam tetrode, except that the whole structure is split along the cathode axis into two halves.

An unusual feature is the grids. The half control grids and half accelerator grids are ladder-like structures, all having the same number of grids wires per inch. Grids are open-mesh and close to cathode.

Applications are many—as power amplifier, voltage amplifier, variable mu, triode, rectifier, mixer oscillator, detector and a-f. amplifier, r-f. amplifier (for short wave or television broad-band amplifiers), and as superheterodyne (with heaters of four tubes connected in series).—Electronics, Mar, p156

Measures Jet-Plane Speed

Accurate measurement of high jet-airplane speeds at Muroc, Calif., is made possible with elaborate photographic and electronic equipment. Datum planes at each end of the course were established by surveys accurate to one part in 600,000.

High-speed cameras record in infinitesimal steps the flight of an airplane as it cuts the datum plane at each end of the course. The timing system is based o 100-cycle tuning forks and square-wav generators, both of which form the an plified electronic frequency standard the system.—Prod Eng, Mar, p155

Aerial Cable Distribution

Reliability, economy, and simplicity di tated use of a 13.8-kv. distribution sy tem of preassembled self-supportin aerial cable in Weyerhaeuser Timber Co new sulphite pulp plant. Installation wa simplified by use of existing structures t support the cable—conveyor structure sides of buildings, roof tops.

It was strung from reels directly ov large pulleys in spans up to 60 ft. Wi this flexibility, circuits could pa through restricted places where op wire could not have been placed.—El World, Feb 26, p70

Hoist Lifts 700 Tons per Hr.

Automatic hoist at Snow Hill Coal Cor is fully automatic, being set in motion b weight of coal dumped into skip. It also be operated manually. When wor ing on automatic, 24,000 lb. of coal spouted into weigh pan and then dump into skip, raised and dumped.

Hoist is a double-faced, cylindro-con cal drum, in either 9- or 16-ft. dia. Mot is 1,250 hp. Hoist will move 700 tons coal per hr. from a level 710 ft. belo dumping point.—Eng & Min J, Mar, p

Common Carriers Larger; Trolley-Bus Record Output

Common-carrier manufacturers turned out 12,720 units during the past year, below the record year of 1948. Most noticeable trend in both inter- and intra-city buses was seating capacity, buses now seating an average of 38.8 persons. In 1946 the average was 33.5.

Trolley-bus production set an all-time record of 1,426 units, the second consecutive year of record-breaking production. At the end of the year, 5,698 units were in operation in 66 cities in the U.S. Half of these cities have a population of 500,000 or over.

Marmon-Herrington announced a 48-passenger trolley bus during the year and Twin Coach Co. will produce a trolley bus seating up to 58 passengers. Santiago, Chile, received 100 trolley buses during the year. Buenos Aires started its first trolley bus line.—Bus Trans, Feb. p67

Vat Dyeing Wool Piece Goods

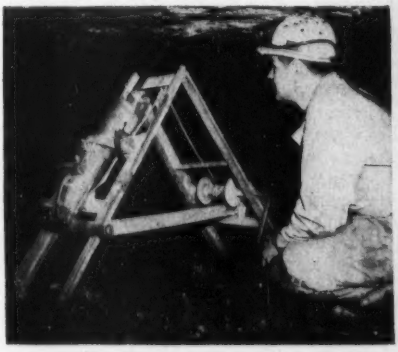
Still in the experimental stage, vat dyeing of wool piece goods by reduced and pigmented methods has proved successful. In the former, vat color is reduced at temperature recommended for cotton with caustic soda and sodium hydrosulphite. Wool is first wet out on a reel or piece-dye kettle. Foaming is beneficial. After bath has run 5–10 min., reduced color is added slowly. Heavy or tightly woven fabrics take longer dyeing periods up to 1 hr. at 90° F. for proper penetration, lighter fabrics taking 30–60 min. Temperature must not exceed 110° F. After dyeing cycle is completed, caustic soda remaining in bath is neutralized by adding sodium bicarbonate. Bath is dropped, material rinsed, oxidized, and soaped.

In pigment method, need for reducing vat color prior to dyeing is eliminated. Color is added to kettle and goods run for 30 min. at 90° F. Manipulation is simplified, the system being limited to colors that can be reduced at temperatures of 90–100° F. This method lends itself better to dyeing of wool-viscose mixtures than the reduced method.—Textile World, Mar, p137

Contract Packing Trend Up

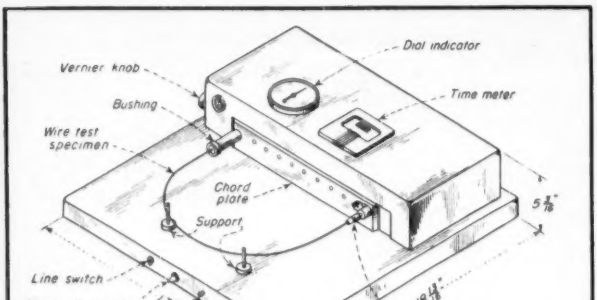
Service organizations to package all types of products, and staffed by specially trained employees and equipped with versatile equipment, are becoming more frequent in the U. S. Companies receive and store production in quantities, store packaging materials, package product, and make final distribution.

By keeping machine constantly in use, companies can package materials at a lower cost than manufacturer whose packaging equipment is in operation only a portion of the time.—Mod Packaging, Mar, p75



FOR LOW-SEAM DRILLING

Amherst Coal Co. designed and built this tripod to carry jackhammer during drilling of roof in low coal seams. Now one man with tripod does the work formerly done by three men. Legs are 1½x2¼-in. angles 38 in. long, hinged at top. Leg spread ranges from 26-38 in., legs being held in position by notched bar. Jackhammer is advanced by ¼-in. wire rope wound on a 1½-in. drum. Here coal height is 36 in.—Coal Age, Mar, p110



FATIGUE TESTER

Tester developed by Hunter Spring Co. is adaptable for wires in diameters of 0.005-0.030 in. Predetermined length is looped through 180° and rotated at 3,600 rpm. Chord plate varies wire chord lengths to 0.001 in. by vernier adjustment. Alnico wire supports prevent vibration. Revolutions per minute are counted by timer reading to 1/10 min.—Elec World, Feb 26, p84

How to Avoid and Remove Watermarks on Aluminum

When the original bright surface of aluminum is to be retained in the final product, it must be protected in storage from watermarking. The danger lies in the chemicals picked up by water from the atmosphere.

Principal precaution is to keep the aluminum dry and prevent it from contacting water for an extended period. Aluminum should be stacked so it can dry easily if it does become wet. It should not be stored directly on the ground or where water can condense and drip on it, nor should bundles be stacked without spacer strips. End stacking is best.

If watermarks occur, they can be removed by a slight etch in a warm caustic solution, by mechanical abrading by brush, or by certain polishing compounds. —Steel, Feb 28, p86

Controls Oil-Well Drilling

Exact weight for an oil-well drill bit as it penetrates oil-bearing formations is provided by a new automatic electronic control. Uniform weight and automatic feed are becoming more important because of greater drilling depths.

The control makes use of a strain-gage assembly, an electronic potentiometer which operates as a weight indicator on the bit, and a penumatic brake which maintains desired weight. The brake feeds the drilling line at a rate that assures a constant and predetermined weight on the bit through all types of sub-surface formations. — Electronics, Mar, p162

Welds Pipe Crosses Quickly

Construction contractor, to avoid delay in sewage-system installation, fabricated five 16 x 16-in. by 8 x 8-in. pipe crosses in 2 days from five tees 16 x 16 in. by 8 in.

An 8-in. hole in each large tee was cut opposite the existing 8-in. hole by an arc-cutting electrode. First a 2-in. pilot hole was made, then enlarged by cutting out pie-shaped segments until the 8-in. hole could be circle-cut.

The 8-in. pipes were welded in place by two types of low-temperature electrodes —the first, a high-tensile ferrous alloy; the second, a nickel alloy for the final pass to eliminate any possibility of cross checking or leakage in weld area.—Weld Eng, Feb, p40

Promises Better Paper Pulp

Curlated pulp is a new approach to pulp processing—one that many manufacturers will watch closely because of pulp properties obtainable

DEVELOPMENT of a new fiber treatment process by Price Brothers & Co., manufacturer of newsprint and board, promises to widen the range of quality obtainable from a given pulp and to permit entirely new combinations of pulp properties. A commercial machine for the new process has been designed and built by Curlator Corp.

The dominant characteristic of "curlated" pulp is a permanent change in the shape of the individual fibers toward more bends, kinks, and twists. Nodules of high-consistency pulp are rolled by the machine in changing directions between two surfaces that compress the rolling nodules.

Fibers are thus subjected to innumerable short radius bends. As cellulose and lignocellulose fibers are somewhat plastic, particularly when wet, kinks and twists tend to take a permanent set. The flexing action also exerts a defibering action on shives and fiber bundles.

In practice, the machine first dewaters the slush pulp to a consistency of 15-25% to form nodules. The nodules pass between a stationary lower plate and a gyrating upper plate to which pressure is applied. Plate surfaces are roughened to provide traction so nodules will roll without slipping, smearing, or shearing.

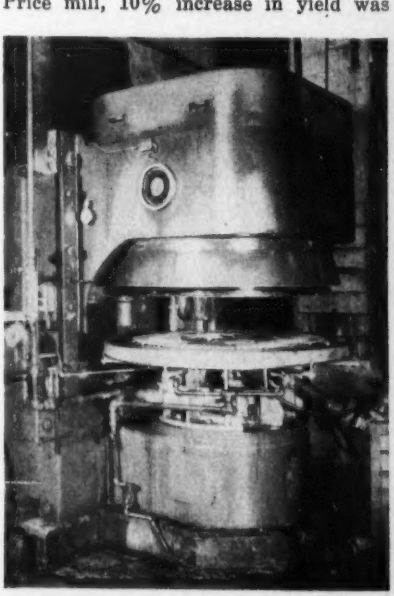
The effect of the process is toward a softer pulp, somewhat opposite to that of beating. Curlated pulp possesses lower bursting and tensile strength, with higher tear and increased stretch and porosity.

Sheets of curlated pulp have an even textured matte-like appearance, and the surface seems more optically level with less gloss and better apparent brightness. Curlated pulp appears to have a deeper color for a given amount of dye.

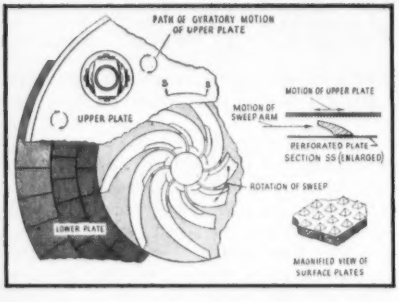
Also, the wet pulp is readily dewatered and gives up water vapor easily on drying. Result is a drier sheet at couch or press section and lower steam requirements at the dryer section.

The softer pulp is of interest to manufacturers of tissues, book papers, and folding boxboard. Increased stretch properties are important for many uses —printing papers, paper bags, cartons. The greater stability of sheet surface is a factor where scuffing, fuzzing, and sheet curl are possible.

Economically, most significant point is possibility of higher pulp yield. At one Price mill, 10% increase in yield was



CURLATOR machine rolls pulp nodules between upper and lower circular plates under a pressure of 15 psi. or less


PATH OF GYRATORY MOTION OF UPPER PLATE
UPPER PLATE
MOTION OF UPPER PLATE
MOTION OF SWEEP ARM
PERFORATED PLATE SECTION SS (ENLARGED)
ROTATION OF SWEEP
LOWER PLATE
MAGNIFIED VIEW OF SURFACE PLATES

PULP enters center of lower plate and is dewatered as it is moved outward by sweeps to rolling and compression area

obtained with practically all the digester yield acceptable for newsprint.

While most work has been applied to sulphite pulp, curlation process has been found to have similar results on sulphate, soda, and groundwork pulps.—Paper Ind & World, Feb, p1590, 1658, 1664.

Chrome Yellow Pigment Made by New Continuous Process

Continuous processing to form chrome yellow is now possible on new equipment installed at Du Pont Pigments Department. The same equipment is used for zinc yellow and molybdate orange, except that for zinc yellow the reaction is conducted batchwise.

In production of chrome yellow, lead nitrate is reacted with sodium chromate and sodium sulphate. From the reactor, the slurry of precipitated lead chromate particles feeds into particle-size development tanks. Here other additions also are made.

The slurry is passed through centrifuges and discharged as paste to the dryer feeder. The feeder, by a revolving cylinder arrangement, forms solid rods of lead chromate which are carried through the belt dryer.

From the dryer, chromate rods are moved to a storage bin by a bucket elevator. They drop from the bin i a pulverizing unit that crushes them a fine powder ready for bagging.—C Eng, Mar, p121

Egyptian Oil Development

Activity in the Asl and Sudr oil field the Sinai Peninsula opens the possib of large-scale petroleum development Egypt. While more recent reports not as optimistic as those earlier year and the Suez graben is charac ized by highly uncertain geology, t still are prospects of major developme

The first Asl producer was compl early in '48, but the field was bro into commercial production only a first of this year. This was made sible by completion of a 12-mile, pipe line extending from the field to Sudr terminal on the gulf.

Other areas in the Sinai Peninsula are being investigated. A wildcat Wady el Feiran is reported to test bbl. daily through ¼-in. choke. Fu work depends to a great extent on mo cation of the Egyptian governme stringent regulations and control.— & Gas J, Feb 24, p98

Welds 750-ft. Radio Towe

A 750-ft. radiator-type radio tower fabricated from solid steel rod and b by International Derrick & Equip Co. using arc welding. The soli construction is stronger, offers less resistance, is cheaper, and takes space than other types of towers. T weighs only 104,740 lb.

Using 4-in. mild steel rod for legs 1⅜-in. rod as bracing, thirty-seven triangular sections are bolted tog vertically. Legs of sections are s at corners of a 6½-ft. square, the b section being tapered in and welded 24-in. dia. plate bolted to a pin co tion. Legs are arc welded to 1¼-in. which are bolted with one section the other.—Cons Meth, Feb, p78

SPEEDS ROAD WIDENING

ening of roads is speeded by this All pose Spreader Co. unit. When strip on side of road has been laid widener can changed over in 30 min. for work on op- ite side of road. Shoulder is prepared d of unit. One-way traffic can be main- ed while unit is in operation.—Eng News-. Feb 24, p30

-in. Core-Drilled Shaft capeway Aids Ventilation

illed to provide a nearby escapeway miners, a 48-in. dia. core-drilled shaft Lorain Coal & Dock Co. mine has im- ved ventilation in the workings. The ft, drilled 202 ft. below the surface, hree miles from the portal. Total cost the shaft is estimated to be one-tenth one-eighth that of a new portal.

Core drilling started at bedrock. The ooth-cut rock wall needed no refacing er drilling, only water and fireclay s necessitating grouting off. At fire- y beds, shaft was reamed to a slightly ger diameter so cemented shaft would ain 48 in. dia. Shaft facilities include ircular steel-casing cage and a fixed rick and hoisting rig powered by a oline engine. Cage accommodates 6–8 n.

Shaft also serves as a partial exhaust the mine's air current. To direct ex- ust air away from the manway entry, ystem of airlocks has been installed.— al Age, Mar, p86

Heat-Pump Water Heater Promises Practical Use

Many engineers believe that a heat-pump water heater has equal, if not greater, possibilities than the heat-pump air conditioner. Such a water heater is readily adaptable to a self-contained package.

American Gas & Electric Service Corp. has built and tested different types during the past 2 years. Experimental designs included: (1) ½-hp. compressor, forced air evaporator, and a water-refrigerant heat exchanger, all located externally to an 86-gal. tank; (2) one in which heat exchanger was located in the bottom of the water tank; and (3) a design in which a hermetically sealed compressor was mounted in the top of the tank and the condenser in the bottom.

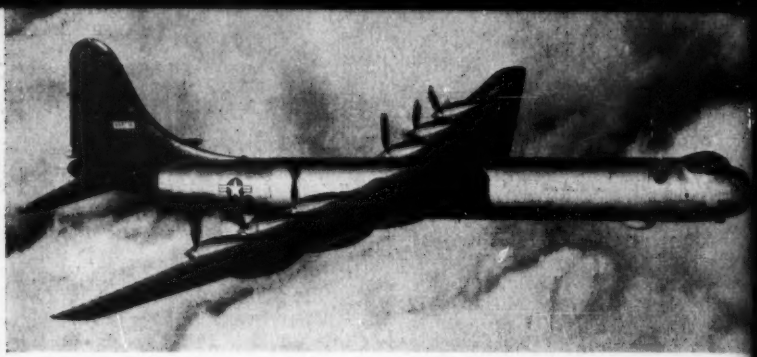
Of the three designs, the third gave the best results and looks most promising for commercial development. It gave an average heating rate of 7,700-8,000 Btu. per hr., using an initial water temperature of 60°F. In drawoff tests, final water temperature in the top compartment was 142-155°F.—Elec World, Feb 26, p66

Cupola-Gas Dust Removal

Cupolas at General Motors Pontiac foundry have been equipped with dust collectors and flame suppressors. The latter type of unit is a windbox with spray nozzles which introduce an atomized mixture of water and air into gases rising in the cupola.

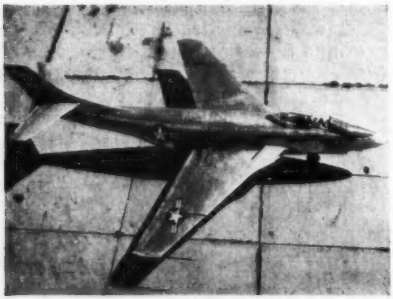
The water-air mixture reduces gas temperatures by 600°F. and consumes any unburned and noxious gases. The equipment maker calls it a stack-gas oxidizer.

At the top of each cupola, a combination of cyclone-type blower unit, conical cap, and water sprays further wets down particles of ash and fine coke and washes them into discharge pipes. Dust-removal efficiency is claimed to be 90-95%.—Foundry, Mar, p124

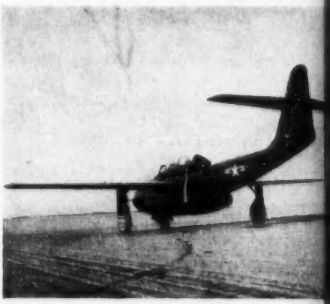


Consolidated Vultee B-36B—Maximum speed 320 mph. (est.). With a service ceiling of 40,000 ft., this 4-engine bomber carries a cargo or bomb load of 84,000 lb.

New Planes Fast, Streamlined



McDonald F-88 Voodoo—Speed estimated at 700 mph. Fighter is powered by a Westinghouse J-34 jet, developing 3,000 lb. thrust.

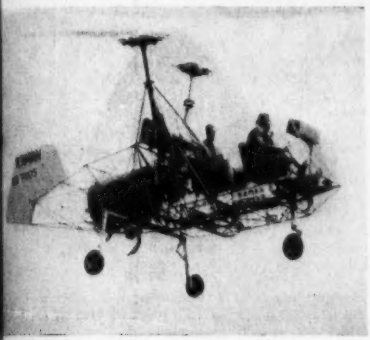


Northrup XF-89 Scorpion—This all-w fighter's estimated top speed is 560 Length and wing spread are both 50

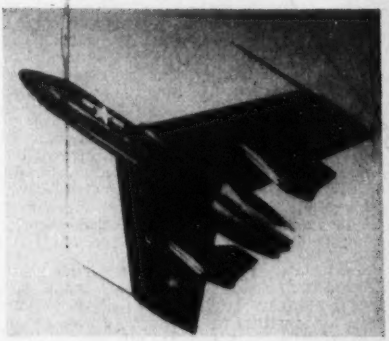
Aero-Flight Streak 165—Cruising at 210 mph., its top speed is 219 mph. Power-plant is a 165-hp. Franklin. It seats two.

Johnson Bullet 185—Cruising a 185 mp personal plane seats four. Not yet duction, it will sell for about $5,000.

oeing XB-47 Stratojet—Maximum speed 630 mph. (est.). Six General Electric J-35 engines ve this swept-back-winged bomber a total thrust of 24,000 lb. The Stratojet crossed the nited States in 3 hr. 46 min. in a test flight—from Aviation Wk. 28th Annual Yearbook.

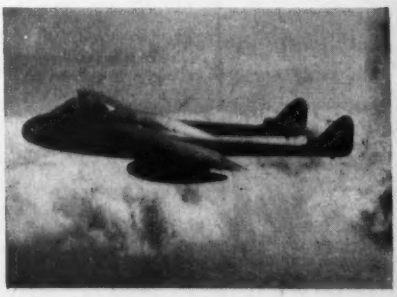


Kaman K-190—Maximum rated horsepower f this 3-place 'copter is 190 at 2,550 rpm. otor diameter is 38 ft.; fuselage, 22½ ft.



Chance-Vought XF7U-1 Cutlass—Speed has not been estimated. The tailless fighter employs two afterburners and two J-34 engines.

Saab-29—Manufactured by SAAB Airplane Co., this swept-wing fighter is still in prototype stage. Sweden is raising plane output.



De Havilland Vampire—Little information is available on this new single-seat jet. Wing spread is 38 ft.; length is 30¾ ft.

Technical Shorts

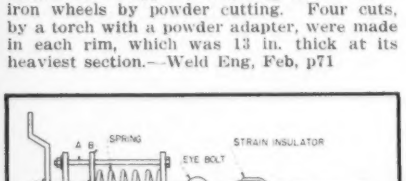
Float Tunnel to Site—A 2-lane vehicular tunnel, constructed by Ingalls Shipbuilding Corp., is being floated in sections to its site under the Texas Hudson Ship Canal. Each of the four sections are 375 ft. long and over 35 ft. dia. Sections were launched from standard marine ways.—Business Wk, Feb 26, p20

Ice-less Fruit Shipping—Modified-atmosphere cars may be the next step in preserving fresh fruit during shipping. Tests show that fruit at 60-85°F. in air modified by oxygen reduction or carbon-dioxide addition keeps as well as at 40-45°F. in normal air.—Food Ind, Mar, pW18

Harness Hot Springs—The thermal region of New Zealand may be developed to supplement hydroelectric power. Two Italian experts, with experience in developing power from volcanic steam and geysers, are expected to be invited to New Zealand.—Power, Mar, p102

Increases Lump Size—Using a Sullivan short-wall cutting machine on its side to trench coal prior to shooting has increased 12-in. and larger lumps at Old Mac Coal Co. Seam is 26 in. thick. Cutter shears three trenches 30 in. deep on 25-ft. centers, two outside trenches being 25 ft. from face.—Coal Age, Mar, p116

Scraps Large Wheels—Bates Expanded Metals Co. scrapped 5-ton, 10½-ft. dia. cast-iron wheels by powder cutting. Four cuts, by a torch with a powder adapter, were made in each rim, which was 13 in. thick at its heaviest section.—Weld Eng, Feb, p71



SPRING ANCHORS TROLLEY WIRES

To eliminate costly breaks of trolley wires in mines caused by extreme changes in temperature this spring dead-end can be used. Heavy coil spring permits expansion and contraction without undue sag or snapping of wire. On bolts A strap B slides freely. Dead-end will work satisfactorily on wires over 500 ft. long.—Eng & Min J, Mar, p107

Steam Best for Textile Drying—Tests conducted by the Institute of Textile Technology show that steam is the cheapest source for drying textiles and steam-heated cylinders are the most practical. Hot-air, infrared, and high-frequency dielectric-heat driers are expensive though practical for special or non-continuous jobs.—Textile World, Mar, p116

Deinking Waste Disposal—First commercial-sized deinking waste-disposal unit will be built in Kalamazoo River valley to reduce steam pollution from paper mills. Oxygen-consuming organic material present in deinking waste solution will be assimilated by harmless type of bacteria.—Paper Ind & World, Feb, p1592

Heavier Than Lead—Developed as a shield against radioactive emanations, an alloy of 90% tungsten, 6% nickel, and 4% copper is finding use in counterbalance weights because it is 50% heavier than lead. Parts are formed by powder metallurgy.—Am Mach, Feb 24, p87

Dumps Trailer Trucks—Ball Bros. dumps semi-trailers loaded with silica sand with a Yale & Towne high-lift platform truck. Disengaged from its tractor, trailer is dumped quickly, saving hand-unloading time.—Cons Meth, Mar, p67

Speeds Materials Handling—A signal board, numbered 1 to 16 to indicate the 16 subdivisions of the Snap-On Tool Corp. plant, has expedited dispatching of materials-handling trucks. Ten-watt bulb lights up behind numeral indicating section needing a truck.—Factory, Feb, p133

Deepest Oil Well—Superior Oil Co. has drilled in California the world's deepest well. Depth by middle February was 17,926 ft., passing previous record of 17,823 ft. World's deppest producer is a Pure Oil Co.'s well in Wyoming.—Oil & Gas J, Feb 17, p75

Lithium Cartridges—Lithium has long been used as an addition agent for deoxidizing and degasifying copper-base alloys. To make it more easily added, it is now available in cartridge form with a measured amount sealed in copper tubing.—Foundry, Mar, p90

Berlin Airlift Grows—By the end of January the U. S.-British airlift into Berlin had exceeded in its 7 mo. of operation the total carried over the Hump in China during 3 yr. of war. Over 11,000,000 tons have been carried in 125,000 flights.—Aviation Wk, Feb 14, 15

Conveyor Serves Weldors—Handling was reduced and production raised by installation of a power belt conveyor to serve the welding department of Rapids-Standard Co., Inc. Belt runs between welding workstations. As weldment is completed, weldor places work on conveyor running to grinding and inspection departments. Fume-removal ducting system is placed below conveyor line.—Factory, Mar, p91

Measures Radio Audience—Columbia Broadcasting System has developed a method to measure number of radio listeners. It involves having 1,000 transceivers located in preselected homes. When actuated by pulses from radio station, they return uhf. pulses to station to show percentage of sets in use.—Electronics, Mar, p180

Universal Height Micrometer—Ericsson Telephones, Ltd., England, finds useful a shop-made height micrometer consisting of gage-block holder and base, a 1-in. micrometer head, and a beam to hold the head vertically. With gage-block accessories, the instrument has wide use.—Mach, Mar 5, p1447

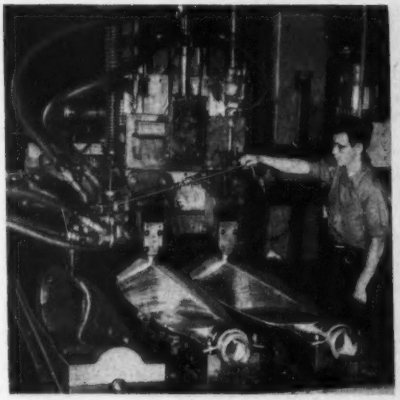
Lights Cloth Inspection—Final inspection of textiles at Uxbridge Worsted Co. has been made easier by providing 400 footcandles on perch-boards across which cloth is pulled. Perch lights, mounted at an angle in front of perch-boards, each have ten 40-w. fluorescent daylight lamps.—Elec C&M Mar, p144

Plates Nickel on Zinc—Direct nickel plating on zinc diecastings is reported from England. Bath per gal. contains 12 oz. $NiSO_4$, 32 oz. $NaCO_3$, 2 oz. NH_4Cl, and 2 oz. boric acid Bath temperature is 68-77° F., and current density is 10-15 amp. per sq. ft.—Iron Age, Feb 24, p84

Cut Leaf-spring Friction—Interleaf friction is reduced in Studebaker cars by placing small (1/40-in. dia.) hardened-steel balls between leaves. Balls are pressed into woven adhesive tape the width of the spring and tape is fastened to ends of the spring.—Am Auto, Mar, p42

Saves on Return Air—A New York restaurant has reduced air-conditioning costs by reusing 10,000 cfm. of return air as part of 17,000 cfm. needed to control odors. Return air is passed through dry-type dust filters and activated-carbon canisters that act like gas masks.—Oper Eng, Mar, p36

Herringbone-cleated Roller — New South Wales road contractor is using a herringbone-cleated roller to break large shale boulders. Roller is 5 ft. dia., carrying 5 tons ballast. Cleats are 2x2x¾-in. angles spaced on 10-in. centers.—Eng News-Rec, Mar 10, p35



HOLD PROPELLER BLADES

Steel propeller blades, at Aeroproducts Div., General Motors Corp., are contour-planed with magnetic chucks gripping the work. Large magnetic surface conforms to blade shape, and thrust is taken by straps over propeller hubs. Two tools on double clapper-box follow roller riding on templet at left.—Am Mach, Mar 10, p99

Aids Synchronous Motor—Reducing supply-circuit reactance by two-thirds improved performance of a synchronous motor driving a scrap-metal crusher. Motor shutdowns were eliminated, and time running out of synchronization was decreased by 97%.—Elec World, Feb 26, p77

Porcelain-enamel Bearings—To form corrosion-resistant bearings for food and chemical industries, a synthetic-rubber journal fits over the shaft and revolves against a porcelain-covered steel tube. Assembly has negligible friction and is lubricated by the liquid.—Prod Eng, Mar, p3

Speeds Gear Deburring—Power brushing with tampico brushes and abrasive compound has proved extremely satisfactory at G. A. Gray Co., machine-tool manufacturer. Result was 600% gain in production speed on steel-gear teeth. Brushes, 16 in. dia., are operated at 1,750 rpm.—Steel, Feb 21, p118

Cattle Trailer-trains—Australian cattlemen have partially licked railroad shortages by using trailer-trains to carry livestock to markets. Using 200-hp. tractors, cattlemen move two 45-ft. and a 36-ft. trailer hitched together. Trains carry 90 head of cattle or 60 tons of wool.—Business Wk, Feb 19, p118

World Auto Use at Record

Total vehicles in operation during 1948 reached 57.5-million; production during the year reached an all-time high of 6.6-million; scrapping high

CAR, TRUCK, AND BUS operation throughout the world reached 57,502,898 units in 1948 according to the 28th annual world automotive census of *The American Automobile*. This total represented a gain of 8.7% over the 1947 total. The increase is about three times the prewar rate of gain.

During the year, 6,627,564 new units were manufactured, representing peak production in most manufacturing countries. Operational increase over 1947 was slightly below the total production figure because of wide scrapping of old units for the first time since the war. This was only the third year that world automotive production passed the 6¼-million figure—passing it in 1929 and 1937.

> World production of vehicles during the first 10 weeks of 1949 was about 10% ahead of the corresponding 1948 period. Truck production lagged 1948 by about 2.6%.

Of the 57-plus-million units in operation, 16,830,926 were in operation outside the United States, a rise of over 1¼-million units overseas. No figures were received for operation within the U.S.S.R., but figures included operations in 143 countries and territories. Also excluded were some Caribbean, Pacific, and South Atlantic islands having a total car population of possibly 5,000 units.

Severe exchange problems throughout the world curtailed car exports somewhat. Demand was not satisfied; more units would have been bought could they have been paid for.

Trucks and buses in operation totalled 14,717,609—a rise of almost 50% over 1947. It is believed that about 800,000 of these are war surplus army trucks—mostly U. S. Commercial vehicles (trucks and buses) outside the U. S. and Canada comprise about 45% of all units.

Supply of motor fuels was adequate in many areas, although rationing persisted in some countries. On a world basis, supply appears to have met demand. Marshall Plan money to buy motor fuels has resulted in greatly increased highway traffic in western Europe.

Consumption of diesel-engine fuels is rising throughout the world, although use has not spread to the tractor field. Sales and other taxes on automobiles, on a world-wide basis, are generally increasing although taxes on commercial vehicles in some countries are lower.

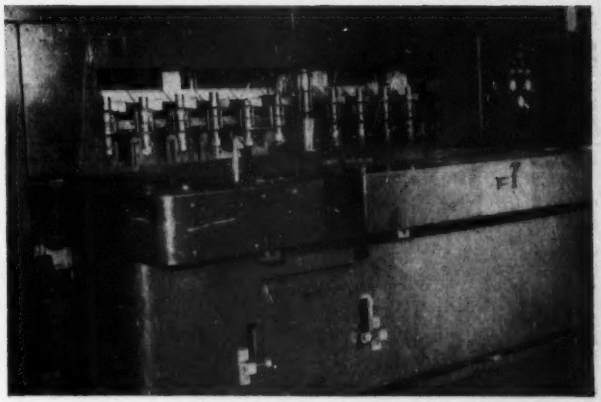
Tractor operation, reported for the first time by the survey, showed 556,99[illegible] units—both wheeled and crawler types—in use in 35 countries outside the U. S. and Canada. Reports were received from only 25% of the countries but the complete geographical breakdown is as follows: Africa 22,745; Americas (less U. S. and Canada) 10,059; Asia 4,169; Europe 421,769; Oceania 98,248.

Imports of automobiles into the U. S. during '48 stood at 28,047, valued at $29,637,141. This compared with 1,453 units imported in 1947.—Am Auto, Apr p35

World Automobile Operation

	1946	1947	1948
Africa	608,870	731,474	847,976
America (Less U. S.)	2,795,968	3,068,699	3,475,524
Asia	487,220	656,963	747,677
Europe	6,641,099	9,767,932	10,281,929
Oceania	1,332,201	1,350,639	1,477,820
Total (Less U. S.)	11,865,358	15,575,707	16,830,926
United States	33,530,430	37,297,184	40,671,927
World Total	45,395,788	52,872,891	57,502,894

GEARS HARDENED ON RF MACHINE



International Harvester Co. can harden 20 different gears in this Westinghouse 11-station automatic induction (rf) hardener. Gears are loaded into moving fixtures on front table. Preheating is done in 4 stations at 9,600 cycles. Fifth is hardening at 250,000 cycles and quench, sixth quench, seventh air blowoff, and last hour drawing.—Iron Age, Feb 17, p86

Basementless House Heated With Radiant-Forced System

Combining favorable factors of radiant warm air and forced warm air systems, the new radiant-forced system of heating basementless houses requires a specially designed furnace. Several hundred of the Internations Oil Burner Co. systems are in operation in midwestern United States.

Warm air is distributed through ducts in the slab or under floor at walls. This produces radiant heat up walls and prevents cold air wash down walls. Warm air outlets are installed under each window to eliminate cold drafts blowing down to floor from windows.

Furnace must be centrally located. It is shipped as a package. All tinsmith must do for installation is to knock out blanks at duct connection.—Am Build, Mar, p110

New Continuous Diffuser

Morton continuous diffuser, recently developed for the beet-sugar industry but applicable to others, will be built by Oliver United Industries.

The unit has 12 cells, each a V-shaped tank fitted with a scroll for about 90% of its length. At the end of the scroll are four sets of fingers for lifting and moving beet chips from one cell to another.

Chips and juice enter opposite sides of same cell and travel through it together. At discharge end, chips are lifted into the next cell toward tail end by fingers, while juice flows by gravity into the next cell toward the head end. This gives concurrent flow in each cell and countercurrent flow from cell to cell.—Chem Eng, Mar, p22-PPI

Simplifies Reversing Prop

Designed to perform all operations accomplished by multiple control relay installations now used to control propeller pitch changes, a new control unit has been developed by Consolidated Vultee Aircraft Co. Prop reversing reliability is increased and weight and cost of installation are reduced with the new unit. It is adaptable for use with all standard reversable pitch propellers.

Unit consists of a mechanically operated switch for reversing and unreversing operations and a coil-operated method of cutting off reversing mechanism when prop is in full reverse. Arm on top of unit is operated by a cam in throttle system.—Aviation Wk, Mar 21, p56

UNUSUAL RECORD CHANGER

Radio Corp. of America, Victor Division, has introduced a new type of phonograph record with a 1½-in. spindle hole. It operates at 45 rpm., is 6⅞ in. in dia., and plays 5 min. Needle tip radius is 0.001 in., groove width 0.0025-0.003 in. (275 grooves per in.), and tracking weight 5 g. Changer has 1½-in. center post which houses the fast-drop mechanism. Capacity is eight records.—Electronics, Mar, p126

More Byproducts from Milk

Avoset Co., San Francisco, announces two new chemical from milk—mucic acid and potassium acid saccharate. They are made from crude lactose sirup; oxidation of 1 lb. lactose gives 0.4 lb. mucic acid and 0.4 lb. saccharic acid.

The mucic precipitates out and is washed, dried, and milled to a white powder of 98-100% purity. The saccharic acid is precipitated as potassium acid saccharate, purified, and dried to powder form.—Chem Eng, Mar, p21-PPI

Prefabricated Structures for Cabinets and Housing

Prefabricated structures often can adapted for industrial cabinets and h ings with a saving in cost. These members, made by the Lindsay C consist of a sheet-metal panels, fram shapes, and fittings.

Advantages include minimum time between design and production, lo tooling costs, and ease of assembly w little or no tooling or skilled la needed.

The framing is composed of a male "tensioner" member and a female "channel" member. In assembly, formed flanged edges of panels enter channel and are clamped by the t sioner. As tensioners are tightened, she are drawn to a controlled uniform t sion.

Sheets and framing members can made of mild, galvanized or stainl steel, aluminum, magnesium, or Mon Tensioners and screws may be chromi plated to improve appearance. The on limitation on finish is that vitreous por lain enamel should not be used unless t structure is to be coated and baked aft assembly.—Prod Eng, Mar, p128

Trend to Red Light Cockpits

A noticeable trend is developing amo airline operators and airframe manu facturers toward red lighting instead black lighting for cockpit illuminatio Pan American and American Overseas as well as Boeing, Convair, and Dougla are adopting the red-light method, aug mented by white lighting. During th war it was determined that light wave lengths of 600 millimicrons or over wer suitable for cockpit illumination. On limiting factor is that emergency handle and switches under red light appea white or at best a pale red and los their signal effect.—Aviation Wk, Mar 7, p34

...ew Water Heater Baffle ...mproves Cold Water Mixing

...he McGraw-Electric Co.'s Clark Div. ...s included the new "sombrero" cold-...ater baffle in their newest deluxe model ...oastmaster water heater. The sombrero ...affle, shaped like the familiar Mexican ...at, has a high, parabolic crown and ...ide, flat brim. Cold water coming in is ...oken by the crown and evenly distrib-...ted around the brim. Introduction of ...old water this way effectively prevents ...s mixing with hot water higher in the ...ank.

The heaters are available in stand-...ardized models of 40, 50, 67, and 82 gals. ...his standardization makes it possible ...o install an 82-gal. model in the same ...pace required for the 40-gal. model.—...lec Whols, Mar, p138

...peeds Corn Sterilizing

...A new technique, the Cremogevac proc-...ss developed by United Products Co., ...chieves transfer of heat by convection ...n sterilized canned corn.

Cremogevac corn consists of corn ker-...nels, corn cream component, and brine. ...Components are put into the container ...separately so the cream is kept stratified in a layer separate from kernels and brine. Preferred method is to put in cream, then kernels and brine, and to invert the sealed can.

During heating, temperature rises rapidly within the mass of kernels, because heat is carried to the center by convection currents. Bringing the center up to 100% leathal heat more quickly than in premixed cream style corn avoids overcooking other parts.—Food Ind, Mar, p84

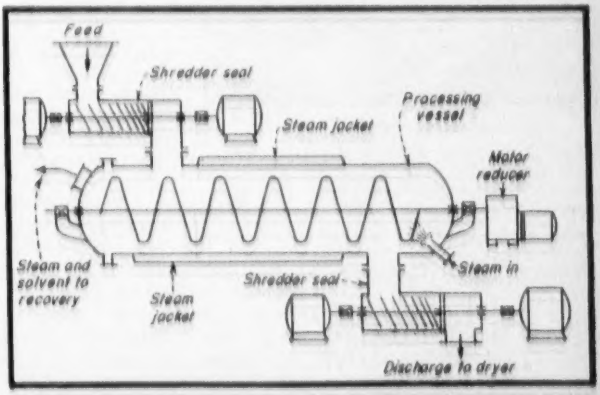
Electronic Control Trigger

British National Physical Laboratory has developed an electronic trigger to operate a control when the strain on any structural or machine member exceeds a predetermined value. A typical application is to a reciprocating machine for testing lubricants; when seizing occurs, the strain increase stops the driving motor.

In use, resistance strain gages are glued to the member in question and connected to form an ac. bridge. Strain in the member produces a voltage, which is amplified and applied to a two-triode trigger circuit. Output from an output stage following the trigger circuit operates warning lamp and motor control.—Machinist, Mar 5, p1449

OIL-SEED PROCESSING

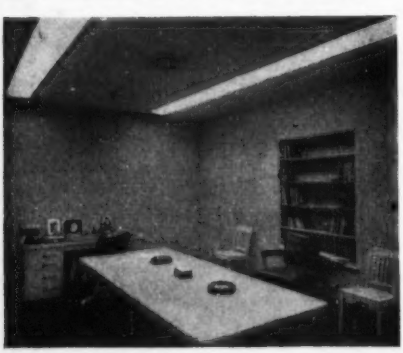
Conventional method uses three steps to prepare toasted oil-seed flake for animal feed — desolventizing, deodorizing and toasting. New process combines operations in single piece of apparatus having a conveying and mixing spiral and a steam inlet at discharge end. "Shredder seals" allow continuous feed and discharge under pressure.—Chem Eng, Mar, p141



Planned Lighting from . . .

. . . Reception Room . . .

Good lighting and clever design combine to give this reception room 45 foot-candles of light at desk level from ten 8-ft. slimline lamps mounted above the wooden louvers.



. . . to Conference Room

Holoflux two-lamp, 40-watt troffers combined with light walls produce 50 foot-candles on the table and 35 foot-candles on the desk.—Elect Whols, Mar, p86

Freezer Storage for Spices

Tests by U. S. Army Quartermaster Food & Container Institute show that freezing has little or no effect on seasoning strength of cinnamon, nutmeg, and sage. The tests were made by incorporating spices in foods that were then frozen and stored. Throughout storage of 1 year, no change in seasoning strength was observed.—Food Ind, Mar, p116

Carbon Correction Applied to More Types of Steel

Application of carbon correction process has been extended at Republic Steel Corp. to many types of steel. With this process, surface carbon is held to the same content as the core or increased slightly.

Processing is accomplished in radiant-tube car-bottom type furnaces under a nitrogen atmosphere enriched with 3-5% natural gas. Temperature control is automatic and precise.

Uses now are many: pins for track-laying tractor treads, piston pins, king pins, textile-machine spindles, fan shafts, washing-machine parts. Carbon correction can be applied to plain carbon steels, low-chromium steels, high-manganese high-sulphur steels, and others.

Use of carbon-corrected stock up to 1¾-in. dia. or thickness has proved most economical practice. Above that size, turned and polished bars can be bought about as cheaply as carbon-corrected bars.—Steel, Mar 7, p108

Two Plane Records Set

Using aerial refueling planes over the Azores, Dhahran, the Philippines, and Hawaii, a USAF 14,000-hp. B-50 made the first non-stop globe-circling flight last February. Plane covered 23,452 mi. in 94 hr., averaging 239 mph. Unrefueled the plane has a range of 6,000 mi.

Flying a 185-hp. Beech *Bonanza*, William Odom flew non-stop from Hawaii to New York City, just in excess of 5,000 mi. The plane was fitted with special cabin and wing tanks to bring total gasoline capacity to 288 gal.—Aviation Wk, Mar 14, p14, 16

Poor Welding Wastes Tungsten

Improper welding procedures and oxidation of electrode tips contribute to excessive consumption of tungsten and to tungsten weld inclusions

TUNGSTEN CONSUMPTION in inert-arc welding may present problems of cost and weld inclusions when proper operating procedures are not followed. For some types of welding, moderate tungsten inclusions can be tolerated, but in most applications they are removed because of their unknown effect on weld strength, corrosion resistance, and impact resistance.

In welding aluminum, the electrode must never touch the molten metal. Otherwise, the aluminum seems to vaporize and disrupt the arc, causing sputtering and black splotches on the work. Cleaning the electrode then causes a considerable tungsten loss.

Another cause of tungsten loss is incorrect current density. If current is too high, electrode tip becomes molten and drips during welding or when the arc is extinguished. If current is too low in dc. straight polarity welding, the electrode may neck down and erode. On dc. reverse polarity, tungsten is readily lost by overheating.

The method of starting the arc also affects tungsten loss. When an arc is struck, the electrode conducts the full welding current immediately and some tungsten is lost because of excessive current flow. The solution is to start the arc at a reduced current level.

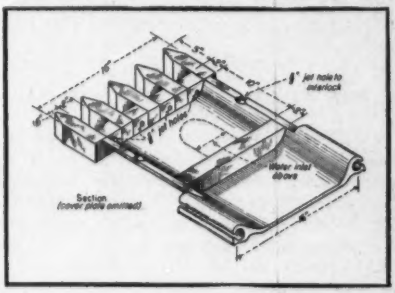
The major cause of high tungsten loss is oxidation. Presence of tungsten oxide on the electrode tip results in a wild arc and blasting off of tungsten from the end of the electrode.

This blasting, known as tungsten throw-down, will occur on starting and may last for several seconds until all oxide is removed. Chief cause of oxidation is cooling from previous weld.

A tungsten electrode begins to oxidize at 600° F. When an arc is stopped, the gas flow should be continued to allow the electrode to cool under protective atmosphere until its temperature is below the oxidation stage.

If water-cooled holders are employed, the water should be kept on to hasten the cooling period and save gas. Gas flow may be required for 5–50 sec. after the arc is stopped, and can be regulated automatically by a time-delay shut off on gas and water solenoid valves.

If the gas-protective time is too short, excessive tungsten loss and contaminated welds may occur. If too long, gas is wasted. Whether proper cooling is being obtained can be determined by checking used pieces of electrode. If they are not bright and shiny on the tip but have become brown, blue, or dusty yellow, the gas-flow period should be lengthened for better protection.—Weld Eng, Mar, p42



SPADE JET CUTS CLAY

Sinking of over 50 mi. of steel sheeting at the Garrison Dam cutoff wall is being facilitated by this spade jet built into the tip of a sheetpile. Jet is a 30-ft. length of sheetpiling with a pipe running along arch and terminating in a manifold chamber at tip. Steel teeth below manifold give unit a combined chapping and flushing action to cut through clay. Unit is raised and lowered by crane.—Cons Meth, Mar, p62

Pictures of V-2 in Flight Aid in Rocket Control

Motion picture heliograph system, developed by G. M. Giannini & Co. and used since 1947 but just removed from the "secret" list, tells pictorially what happens to a V-2 rocket in flight. Pictures are exposed at ¼-sec. intervals throughout the rocket's ascent and are invaluable aids to researchers in delevoping corrective measures for erratic flight.

The heliograph is a simple instrument consisting of a battery box, armored camera case, and optical box. Camera is placed in each of the three vertical fins and views landscape through 1 mm. lenses mounted flush with skin. Pictures show relative position of sun and horizon. Images are caught by a mat-ground spherical base lens and it is this image that the camera records.

The enlarged pictures are super-imposed on a calibrated latitude and longitude grid. By mathematical computations, rocket's position during each picture can be determined. Camera is electrically actuated.—Aviation Wk, Mar 21, p26

Frees Feedwater of Oxygen

In high-pressure steam plants, oxygen is removed from boiler feedwater by (1) open direct-contact deaerating heaters and (2) surface condensers with deaerating hotwells. The first method is more commonly used, but the decision as to method selection depends on the particular installation.

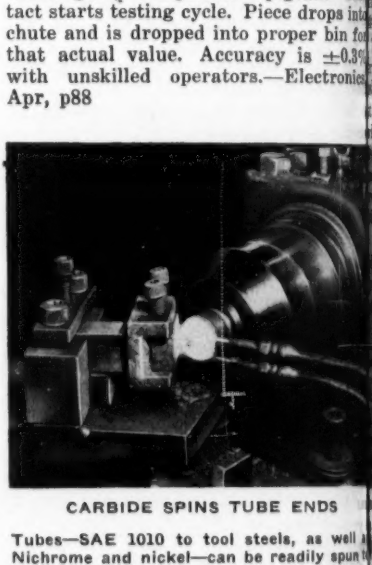
The cycle with deaerating heater shows slightly better heat economy because the condensate can be heated to full saturation temperature and the bleed condensate does not all cascade back to the condenser.

The closed-heater cycle is probably simpler to operate. With the deaerating heater, chances of contaminating boiler water are less likely. Condenser deaeration may require injection of additional chemicals into the feedwater.—Power, Mar, p88

Bridge Tests Components

Resistor, capacitors, inductors, or any impedance elements ranging from 1-ohm to megohms can be tested and sorted automatically by a new Wheatstone bridge. Components can be sorted into eight classes depending on their deviation from specified value at a rate of 1,800 components per hr.

A standard of the value of impedance being tested is plugged into machine and components are fed into test jig. Jig consists of two sets of metal faced jaws which grasp component's pigtail. Contact starts testing cycle. Piece drops into chute and is dropped into proper bin for that actual value. Accuracy is ±0.3% with unskilled operators.—Electronics, Apr, p88



CARBIDE SPINS TUBE ENDS

Tubes—SAE 1010 to tool steels, as well as Nichrome and nickel—can be readily spun to closed ends or holes of required diameter by use of carbide spinning blocks. Two oxygen-natural gas torches heat tube as it is spun at 1,000 rpm. by carbide block held in tool post. Production on 1¼-in., 22-gage tube is 280 per hr. Closed end withstands 200-psi hydrostatic pressure without other sealing.—Am Mach, Feb 24, p81

sphalt Coat on Pipeline oced by Portable Plant

e sections for Socony-Vacuum's 255- pipeline (35,000 lengths of 8-in. pipe) re coated with a fragile bituminous ting by a portable plant, moved five es during laying. Trenching, electric- ding of sections, laying, and backfill- in the rough terrain were standard erations. Coating and transporting e to site posed a problem—the port- plant was the only solution.

Steps were: cleaning, heating, prim- coating, white wash, and cooling. e was fed 25 fpm. through a "rota- at," an oil-fired furnace, and a bitu- nous pressure spray. Pipe emerged at 0-160° F. Coating followed.

The plant delivered 12 tons of mix per mix being 87% sand, limestone, and estos and 13% asphalt. Mix was fed 350° F. by hopper to screw pump ich forced it into coating chamber which it was extruded onto pipe tions. A 10-in. end section was left e of coating to permit field welding ithout necessity of prior cleaning.

Sections were finally coated with itewash, said to reduce drying time m 3 to 1 hr.—Eng News-Rec, Mar 3, p

ts Stripping Frequency

uiring less stripping than standard, ew wire clothing designed by Benja- Booth Co. saves production time, or, and raw materials. It can be ipped and ground when desirable. It s been under test in a carpet mill for year, averaging 14 days between clean- gs.

Shape of wires, use of plastic face on undation, and height and angle are asons given for efficiencies. Teeth have long narrow shape instead of the andard round shape. Plastic face is ater- and oil-resistant.—Textile World, ar, p143

SEALS TELEVISION TUBES

Both ends of conical metal shell of 16- and 19-in. television tubes can be sealed by induction heating. Single-turn coil heats outer edge of metal cone enough to melt glass in contact with it and to form seal. Tube rotates during sealing. Glass disk is held up by air pressure inside assembly.—Electronics, Mar, p126

Heat Treat Beyllium-Copper

Beryllium-bearing, copper base alloys obtain best properties by heat hardening, with or without cold working. It is adaptable to standard low-temperature or short-time high-temperature treatment.

Low-temperature treatment requires ½-3 hr. at 600–660° F. Short-time treatment requires ¼–1½ hr. at 660–725° F. Each has its advantages.

Fully formed parts may be hardened in a circulating air furnace, muffle furnace, or salt bath. Close temperature control is essential— no more than ±10° F. variation at 600° F. and ±5° F. at higher temperatures. Controlled atmospheres are not generally necessary, as slight discoloration does not impair physical properties. Any oxide film can be removed by pickling in sulphuric acid for about 10 min.—Iron Age, Feb 24, p78

Induction Logging Measures Resistivity in Oil-Base Mud

Resistivity measurement of formations traversed by drill holes is standard practice. It generally involves use of either (1) electrodes contacting the mud filling the bore hole or (2) scratcher electrodes making direct contact with formation.

A new technique, induction logging, requires no direct contact with mud or ground. Therefore it is particularly useful for logging dry holes or holes filled with oil-base mud.

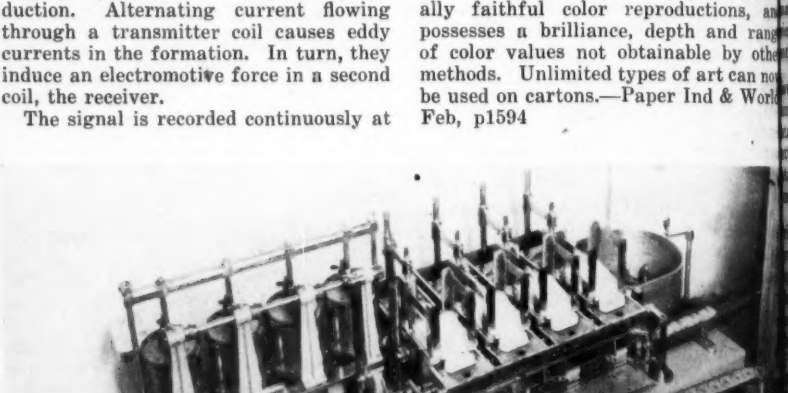
As indicated by the name of the method, the formation surrounding the logging apparatus is energized by induction. Alternating current flowing through a transmitter coil causes eddy currents in the formation. In turn, they induce an electromotive force in a second coil, the receiver.

The signal is recorded continuously at the ground surface while the device is slid along the hole. The record thus produced, called the "induction log," shows variations of ground conductivity and inversely, the resistivity with respect to depth.—Oil & Gas J, Feb, p168

Gravure-Prints Paperboard

Sheet-fed gravure printing on paperboard is now being produced on presses built to specifications set up by Robert Gair Co., makers of folding cartons. Previously, such presses were adapted only for printing on paper.

Advantages are that absolute fidelity of reproduction on boxboard is assured. Sheet-fed gravure printing gives unusually faithful color reproductions, and possesses a brilliance, depth and range of color values not obtainable by other methods. Unlimited types of art can now be used on cartons.—Paper Ind & World, Feb, p1594



MACHINE FORMS CARTONS; PACKS ICE CREAM

New machine made by Arden Farms Co. forms cartons at right, then feeds them under four filling cylinders. Chain moves filled cartons around curve and positions them under lid-closing mechanism. Cartons are elected onto small conveyor leading to hardening tunnel. Machine capacity is 60,000 per hr.—Food Ind, May, p74

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ter Materials Handling—A 47-page dbook, this report discusses how 11 jor companies have been able to re- e handling costs and, at the same e, shorten manufacturing cycles, have aller inventories, make quicker deliv- es, utilize space better, and improve rking conditions.—Factory, Jan

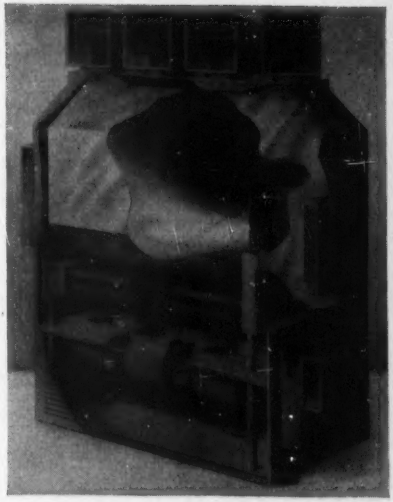
r to Machine Beryllium Alloys—This prehensive 16-page report gives full ails on different machining methods, ting-fluid recommendations, and char- teristics of beryllium-copper alloys.— Mach, Feb 10

ciples of Electroplating—Prepared the metalworking executive, 16-page rt covers cleaning, plating practice, ting-room equipment, layout, auto- tic plating, inspection, and test.—Am h, Mar 24

ed Control for Electrical Drives—This page report analyzes and graphically pares 21 methods of electrical speed trol. Given are performance character- s, equipment requirements, circuit grams.—Prod Eng, Jan

gh-Production Drilling

General Electric Co.'s Erie works, a ially designed carbide drill can re- ve up to 65 cu. in. per min. The job lathe-drilling a 3½-in. hole 14 in. deep 40-carbon steel. Water at 90 psi. ols, drills, and removes chips. Holes e true to within 0.0005 in.—Am Mach, b 24, p87



STAINLESS-STEEL HEATER

Substituting stainless for low-carbon steel in combustion chamber of Dravo direct-fired heater reduced weight of component by 82%. High oxidation point of 1,650°F. permitted elimination of refractory lining. Heat-transfer rate increased sufficiently to allow 50% reduction in surface area of chamber. Flexibility has been increased as new heater can be laid horizontally or suspended in inverted position.—Prod Eng, Mar, p96

New Liberty Ship Propeller

Bethlehem Steel Co. Shipbuilding Div. has designed a new propeller for Liberty ships (there are over 1,000 such ships in operation now) which enables ships to effect a 10% gain in sea speed on the basis of a maximum engine speed of 66 shaft-rpm. per min. It gives an average of 1¼ knots of additional sea speed as compared to original wheel.

Bethlehem engineers assert fuel consumption should be the same as with the original wheel. Some ships on which the new wheel has been tested report a slight reduction in fuel consumed.—Marine Engrg & Ship R, Mar, p62

New Products

Tiny Decibel Checker—Pocket-sized, permitting quick, accurate noise-level measurement, a new decibel meter developed by Herman Hosmer Scott, Inc., weighs but 2 lb. including batteries. Small size (11½ in. long and 2½ in. dia.) and simplified controls are claimed to enable higher flexibility and easier operation than heavier units. Unit covers range from 30-140 db. above standard ASA reference level.—Aviation Wk, Mar 7, p34

Low-voltage Control—Operating on 24 v., Square D Co.'s control system permits adequate switching of lights by use of remote-control relays. Each relay can be operated from any number of switches or several relays can be operated from one point by master switch.—Elec C&M, Mar, p105

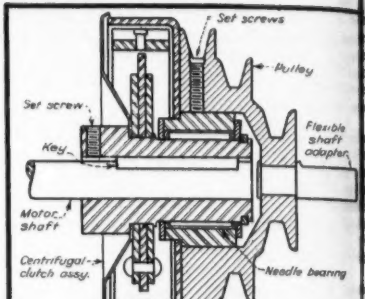
Bottom-dump Semi-trailer — Constructed of aluminum-alloy plate and structural members, a new bottom-dump semi-trailer has a 54-cu. yd. capacity, yet weighs no more than a standard 41-cu. yd. unit. Bonus from light construction is 8½ tons of coal per trip. Empty hauls are less costly. Trailers were designed by United Iron Works Co.—Coal Age, Mar, p170

Measures Thickness—E. J. Cady & Co.'s new micrometer measures thickness of sheet materials up to ½ in. Uniform measuring pressure is maintained at all times. Reading is given on 6-in. dia. dial in whole or half thousandths.—Paper Ind & World, Feb, p1670

Acoustical Glass Tile—Because of its low density, a new light-weight, perforated acoustical tile of pressed glass fibers gives high acoustical efficiency with only 196 perforations per sq. ft. Tile weighs 0.7 lb. per sq. ft. It is an Owens-Corning Fiberglas Corp. development.—Ceramic Ind, Mar, p41

Coats Ferrous Metals—Combined cleaning and coating compound, Detrex 79, is applied to ferrous metals in hot water. Offered by Detrex Corp., it leaves a light, bluegray, crystalline phosphate film that serves as paint base.—Power, Mar, p192

Truck Climbs Stairs—Loads up to 500 lb. can be moved up stairs easily by a new crawler base. Two rubber belts run over grooved aluminum wheels, load being carried by belts. Belt tension is controlled by movable rear wheels. Front wheels are braked by cable control on handle. On level ground, unit operates like a 2-wheeled truck. It is a development of American Machine Works, Inc. —Business Wk, Jan 29, p52



PULLEY-CLUTCH UNIT

Continental Motors Corp.'s Multi-Tool, portable power source for field operation of machines or tools, features transmission unit that includes clutch, pulley, and adaptor. Centrifugal clutch engages at speeds above 1,200 rpm. When speed drops because of overload, clutch disengages and prevents engine from stalling.—Prod Eng, Mar, p99

Tests High Voltages—Hi-Volt model 50 made by Industrial Devices, Inc., is intended for testing transformers such as used for oil-burner ignition and television. Range is 1,600-15,000 v. Unit has 15-megohm multiplier in 7-in. prod and a neon indicator.—Electronics, Mar, p213

Wood Borer—Developed by Kett Tool Co., the Tall Reach wood borer drills holes at any angle. A chuck adapts it to drilling steel and carbide bits to boring concrete.—Am. Builder, Feb, p116

Dehydrates Air or Gas—Niagara Blower Co.'s Aero After Cooler dehydrates compressed air or gas by cooling it below dry-bulb temperature. Protection against freezing in outdoor installations is provided by recirculation of air.—Steel, Feb 21, p137

Alnico Car Key Case—For persons continually locking themselves out of their cars, Vizerak Co., Inc., has developed a key case to eliminate lockouts. Standard car key fits inside an alnico case which can be attached safely to any number of steel members of the car.—Science Ill, Apr, p76

ley Puller—Industrial Engineering Equip-al Co.'s new portable hydraulic pulley er exerts 20 tons pressure and simplifies oval of objects from a motor shaft. It all steel construction mounted on wheels a one-man operation. Pressure to hy-ulic jack is applied by hand pump and e adjustments set it to required dimen-ns. Beam, arms, jack, and pump can be oved from stand for overhead or other .—Elec Whols, Mar, p123

trols Carriage Feed—Monarch Machine l Co.'s Air-Gage Tracer Packaged Unit vides individual motor drive for lathe car-ge feed and automatic cycle operation. ection of feed best suited to any job are ained. Carriage feed ranges from ⅛ to ipm.; return traverse is 100 ipm.—Am ch, Feb 24, p138

s as Car Door—Steel strap-reinforced er retaining doors for box cars carrying k commodities are offered by Signode Steel apping Co. Sizes are doorway width and ights of 3, 4, and 6 ft.—Chem Eng, Mar, 58

justable Rail Holder—Providing an over-rage-holding strength equal to the strength its component parts, Morrison Railway pply Corp.'s new rail holder provides mi-te adjustments. Wing plate is 6 in. wide and fastened to ties by screw spikes or lag ews. Tension rod is threaded on one end, ded to wing plate on the other.—Railway , Mar 12, p74

ge Temperatures—Leeds & Northrup Co. s developed a Speedomax instrument to log omatically as many as 160 thermocouple dings at a rate of 4 sec. per point. It may set to record any single thermocouple or points continuously.—Elec West, Feb, p52

ld-drive Units—Developed by American ower Corp., units combine electric motor d hydraulic drive in sizes to 20 hp. They e applicable to wide range of industrial-chinery drives.—Power, Mar, p142

mmer That Won't Bounce—Hollow metal d filled with steel grit absorbs rebound of ll surface. Tenite plastic tips, 1⅝ in. dia., e force-fitted onto head. Hammers were veloped by H. F. Soldering Co.—Factory, ar, p136

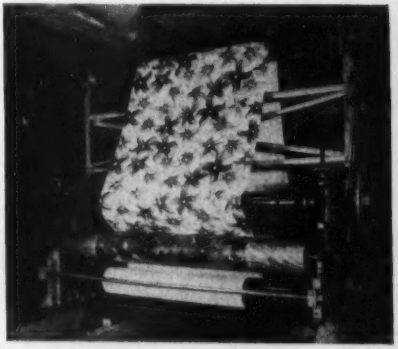
ree-dimensional Display Material — Of ded plastic, new 3-dimensional display ds 10x10½ in. with baquet diamond sur-e have novel reflective qualities for dis-y purposes. Available in 12 colors, the ds will fit flat, curved, or irregular sur-s. It is a Gustave Rubner Inc. de-lopment.—Mod Packaging, Mar, p128

Rubber Traffic Cones—Resembling steel cones, rubber traffic cones placed along dividing line of highways have proven durable and need be replaced only infrequently because of breakage. They are easily handled and can be set up in one-tenth the time of standard traffic barriers. They are a development of Enterprise Development Corp.—Eng News-Rec, Mar 17, p210

Seals Produce Bags—Consumer-Pak Machine Co.'s machine seals bags at a rate of 50-95 per min. Bags hanging from overhead conveyor are carried between two rolls of sealing tape and closed by pressure.—Food Ind, Mar, p177

Indicates Torque—Morill & Morill's Torac torque indicator is a light, high-precision instrument for calibrating torque screwdrivers and wrenchers. Four standard ranges, from 0-2 up to 0-20 lb.-in. are available.—Electronics, Mar, p200

Centrifugal Caster—Herman Pneumatic Machine Co. has developed a four-flask centrifugal casting machine for making cast-iron soil pipe at high rates. Called the Rol-O-Cast, it is expected to produce 120-136 lengths of 5-ft. pipe per hr.—Foundry, Mar, p172



PRINTS 3,800 COLORS

Almost unlimited numbers of colors—3,800 colors done experimentally—can be printed on fabrics by a single roller in one passage with this Chromostyle, Ltd., machine. Color is carried by a plastic layer, thickness of the layer depending on the length of the run. Printing can be done on cloth ranging from sheer nylon to pile fabrics, color penetration on the latter going to a depth of 1 in. Machine costs about one-tenth as much as standard textile printing machines.—Textile World, Mar, p146

New Products (Cont.)

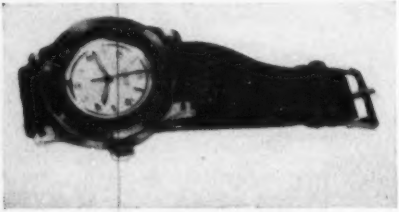
Marble-faced Building Block—Affixed by a new process, marble face of Knighton Process Marble Face Block Licensing Corp.'s concrete block is designed to eliminate necessity of facing the block wall. Smooth interior or exterior wall is provided in one masonry operation. Marble is an integral part of block. —Cons Meth, Mar, p115

Muffler Cuts Fuel Consumption—Fuel consumption is reduced 15% by a heavy-duty muffler developed by U. S. Flexible Metallic Tubing Co. Back pressure on engine, exhaust smoke, and loud noise are eliminated; engine operates cooler on low grades. It is available in sizes up to 175 hp.—Bus Trans, Mar, p163

Arc-spot Welder—Developed by Delta Mfg. Div., Rockwell Mfg. Co., Dual-Weld combination welder does light-duty production spot welding and intermittent arc welding. Spot-weld rating is 5 kva. at 230 v., 60 c. Arc-weld current is 0-120 amp.—Weld Eng, Mar, p74

Distribution Cutout—Intended for use where high capacities are required, Westinghouse Electric Corp's type HC cutout has an interrupting capacity of 8,000 amp. at 2.5 kv. and 5,000 amp. at 5 kv. It may be used on 2,400- and 4,800-v. delta, 4,160-v. wye, and 8,300-v. grounded wye systems.—Elec World, Feb 26, p118

Speeds Silo Filling—Silo filling is speeded by a new hay and silage blower. Load is dumped on trough, conveyor belt moving it to blower. The 42-in. fan and 8-in. pipe place load wherever aimed. Capacity is 20 tons of hay or 25 tons of silage per hr. It is a New Holland Machine Co. development.—Business Wk, Feb 26, p63



SLIDE RULE WATCH

One of Switzerland's latest watch developments is this calculating slide-rule watch. Circular slide rule around dial gives an endless scale. Turning the rim rotates the slide index. Crystal is unbreakable. Finish is polished stainless steel.—Cons Meth, Mar, p122

Explosion-proof Switch—Electro Switch Cor is offering rotary snap switches in explosio proof, dust-tight housings. Assembly may surface mounted with switch handle on don or furnished with switch shaft projectin through base for panel mounting.—Oil & G J, Mar 3, p101

Tracer-controlled Lathe—Lodge & Shipl Co.'s Copymatic lathe incorporates a hydra lic tracer control in model X16-, 20-, and 2 in. lathes. When duplicating, lathe operat from round or flat templets or from the fir part then used as a templet.—Am Mach, M 10, p150

Quick Carbonated Drinks—Wafer Fizz Cor is offering flavored tablets, called Quenchie which make carbonated drinks when droppe into water. Six flavors are available; fo more will be added.—Food Ind, Mar, p134

Ore Reduction Mill—Designed for small o erators, a new reduction mill crushes wi 9-in., 108-lb. manganese balls driven by fr impellers around a 35½-in. saucer. Mill c pacity is 25 tons per day. It is a develo ment of Rotary Mills, Inc.—Eng & Min Mar, p100

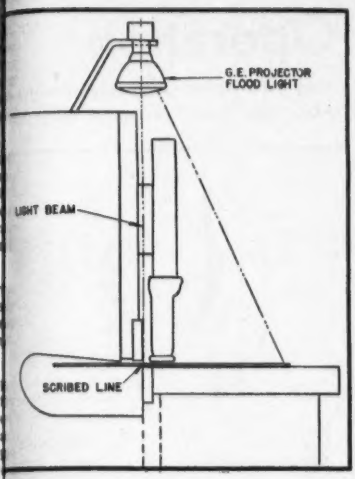
Automatic Interval Timer—Type T-48 time offered by General Electric Co., operates 120-v., 60-cycle ac. with maximum load 1.2 kw. Four models measure time interva of 0-120 sec., 0-15 min., 0-2 hr., and 0-12 Operation is manual or automatic.—Pr Eng, Mar, p170

Tows Trucks—Continuous chain convey with chain running in steel slot under t floor uses a towing pin device bolted to e of 4-wheel trucks or trailers. Trucks are s in motion along route by dropping pin in slot. Manufacturer is Jervis B. Webb Co.- Iron Age, Mar 3, p114

Matchplate Molding Machine—The new un offered by Osborn Mfg. Co., eliminates manual handling in the rollover operatio It allows use of larger flasks than normal employed in matchplate molding.—Foundr Mar, p178

Handy Solder Holder—Eutectic Welding A loy Corp. is offering the Eutec-Silver-We pocket economizer for low heat joining metals. It contains silver alloy feedi through a small hole in top part and flux the bottom.—Elec C&M, Mar, p184

Labels Moving Cloth—Attached to contin ous-processing machines, Adolph Gottsch Inc.'s new roll printer will label cloth speeds up to 900 fpm. It is actuated eith by contact with cloth or by connection to convenient shaft. On porous or smooth clo it will print labels up to 6 in. wide and in. long.—Textile World, Mar, p150



IMPROVES SHEAR LIGHTING

Cincinnati Shaper Co. has equipped one model shear with a shearing-gage lighting unit. A high-intensity light is directed downward to position correctly the scribed line on plate to be sheared. Unit consists of six 150-w. lamps on 30-in. centers in a wiring channel mounted on two bracket arms.—Elec C&M, Mar, p93

Controls Spot Welder—Speeds of over 400 welds per min. and hold-time settings as low as one cycle are possible with Square D Co.'s Class 8992 resistance-welder controls. Consistent starting point for each weld is obtained by coordinating firing-relay operation with ac. line supply.—Weld Eng, Mar p76

Heat Exchanger—Lightweight nonferrous heat exchanger employs brass forgings instead of castings for bonnets and hubs. Ross Heater & Mfg. Co.'s unit has tubes roller-expanded into place to give a tight fit.—Oper Eng, Mar, p74

Ceiling Heat Sheets—Heating element is sealed between layers of gypsum and asbestos in Homes, Inc.'s, new "Solarsheet" ceiling heating panels. Panels are available in varying temperature capacities and sizes.—Business Wk, Mar 26, p62

Portable Fluorescent—Auto-Test, Inc., has introduced a portable 6-w. fluorescent lamp equipment with 25-ft. extension cord with built-in ballast control. Lamp will not burn when on contact.—Elec World, Mar 12, p60

Voltage Multiplier for DC—DC voltage measurement can be extended to 10,000 v. with Sylvania Electric Products Inc.'s new voltage multiplier. The compact unit consists of a 48-in. flexible plug-in lead tested for 22,000 v. breakdown, with a nickel-plated brass contact pin mounted in a 1¾-in. long tapered plastic rod. It can be extended to television high voltage supplies, transmitter plate circuits, industrial electronic equipment, and many other high voltage dc. circuits.—Elec Whols, Mar, p124

Meters Smoke—Permanent-recording gas-sampling meter consists of sampling unit and vacuum pump. Developed by Bacharach Industrial Instrument Co., it indicates smoke density by deposit left on paper disk.—Oper Eng, Mar, p66

Preheats Plastic Preforms—A 3-kw., 40-megacycle preheater, built by General Electric Co., operates on 230 v., single phase, 60 cycles. It will heat 40 oz. of woodflour phenolic compound from 70° to 250°F. in 1 min. or 1 lb. in 24 sec.—Elec West, Feb, p54

Forms Sheet-Metal Locks—Four sets of rolls in model 20 forming machine developed by Roy G. Flagler Mfg. Co. form Pittsburgh lock, double seam, flat S-cleat, and drive cleat in a single pass. It is powered by 2/3-hp. motor with V-belt drive.—Steel, Feb 28, p119

Quick-action Fastener—Blind assembly of parts to metal panels is speeded with Tinnerman Products Inc.'s new speed nut fasteners. Made in two designs, spring arms grip at root of screw thread in one and arms turn under to ride on thread crest in the other.—Aviation Wk, Mar 14, p32

Electronic Gas Filter—Byproduct coke-oven gas can be thoroughly cleaned by Trion, Inc.'s electronic gas filter. Rated capacity is 60,000 cfh. at a 98% cleaning efficiency by discoloration method.—Iron Age, Feb 17, p102

Services Oil Wells—A LeTourneau Tournapull is incorporated in design of the Rambler Rig servicing unit built by International Derrick & Equipment Co. Unit is particularly adaptable for getting into small well locations where dependence on a truck for power is not practical.—Oil & Gas J, Feb 17, p139

FREE SERVICE TO READERS

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Improves Cupola Operation

Better patching of cupola lining often solves operating troubles that seem to be related to the coke, iron, tuyere ratios, or other factors

ECONOMY and efficiency of cupola operation depend to a great extent on the patching of the cupola lining. Patching practice affects the uniformity from heat to heat and during any one heat.

As a lining burns out and the effective diameter increases, there are changes in coke-bed height, tuyere ratio, blast concentration, thickness of metal charge, stock height, and other factors. Uniformity is lost, iron analysis varies.

Some foundrymen change air rates, coke ratios, and even metal charges during the day to compensate for lining burn-out. But the best remedy is to retain uniform cupola dimensions by good patching practice.

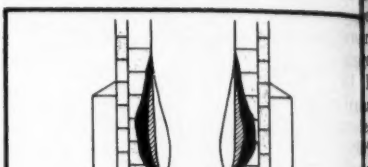
Monolithic or "mud" patches will give satisfactory service when properly prepared. They must be dried before using; otherwise, the moisture in the patch can result in spalling, burning-through, and bridging over the tuyeres.

A moisture-controlled ganister and clay patch, rammed to maximum density and uniformity, is capable of extended service life. One way to reduce burn-out is to put in less, not more, patch material. Making the lining thinnest at point of maximum burn-out reduces refractory loss, flux, and bridging.

This method, called "contour" patching, has cut refractory losses up to 40%. If the first heat of a new lining results in a deep burn, the cupola should not be patched to its original shape. The patch should follow the "natural contour" as determined by the burn-out.

On long heats, a good contour patch will outlast either a straight or a boshed-in patch of the same quality and materials. A monolithic patch can be put in quickly and cheaply, particularly with "air-placement" patching machines.

For hand-rammed linings, a suitable



CONTOUR PATCH, unlike straight and boshed-in patches, follows the contour of the burned-out section

mixture consists of 1 part coarse ganister (⅜ by ¼), 1 part fine ganister (¼ by down), and 1 part of high-refractory plastic fireclay. The mixture should be mulled with 13% water and aged for 2 hours.

Ganister mixtures for gun or air placement are in the development stage. At the present, best results are obtained with 3 parts of ⅛-by-down ganister and 1 part of pulverized fireclay. Moisture content is adjusted for best operation of the gun.—Foundry, Mar, p68

Inventory Taken by Camera

Shutdown for inventory at Plomb Tool Co. has been eliminated since the company began taking inventory with a camera. Steel alloy bar and rod stock are stored in standard horizontal rocks and stack is photographed in place. As clerk counts pieces, she ink-dots end of each piece. Count is placed on a permanent inventory card.—Factory, Mar, p106

od Lighting Maintenance eeded to Cut Light Loss

ior causes of light loss in lighting tems are lamp depreciation, low volt-, luminaire inefficiency, low-reflection rfaces, dirt and dust, and lamp out-.

Lamp aging depends on type and ality of lamp, and is not preventable. sulting light loss may range up to %. Best economy is gained in replac- lamps between 70 and 100% of rated . Light loss from low voltage, how- r, can be made negligible by adequate ring, but may run to 20% with poor ring and circuit overloading.

Luminaire inefficiency varies with type luminaire. Units with high over-all ficiency should be selected. Light loss om room surfaces also is controllable using high-reflection paint. Likewise, ht loss from dirt and dust, which may ge up to 30%, is reduced by proper intenance. Loss from light outages y be as much as 10% from undetected rned-out bulbs.

All these factors should be considered refully during the design stage of a oposed lighting system. The engineer, analyzing the job and studying the onomies possible, should remember that mulative light loss may mount up to %.—Elec C&M, Mar, p73

esign for Textured Metals

errous and non-ferrous metal sheets are ade stronger and stiffer by a cold-roll- process that creates a surface pat- rn. Eighteen standard patterns are ailable in "Rigidized" metals, making em suitable for many applications.

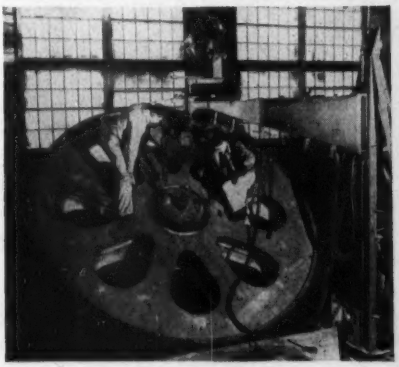
Uses include walls of railroad coaches, at backs and kick-plates of trolley cars nd buses, central aisles of buses, auto- obile dashboards, refrigerator moldings, adio grilles.

Weight-saving feature is apparent in e Viking marine diesel engine. Oil-pan weight was reduced 1,000 lb. by substituting 18-gage cold-rolled steel for cast iron.

High reflection from a surface can readily be avoided by selection of a low-relief pattern, application of correct color, and grinding of raised surfaces to achieve two-tone effect. Design problems involving sound deadening can often be solved by use of perforated patterns.—Prod Eng, Mar, p102

Special Shelves Aid Storage

Stockroom area was reduced from 1,760 sq. ft. to 900 sq. ft.—the space saved being turned into productive area—at Buckeye Tool Corp. by adopting circular steel shelves for small parts. Large parts are stored in standard horizontal bins. Smaller parts are stored in rotating bins with spoke-type spacers, movable to vary the quantity of parts stored. Aisle space has been increased and stock crew reduced 50%.—Factory, Mar, p121



WELDING BULL GEAR

Large marine propulsion "bull gear" is one of two that will drive an ore carrier from 7,000-hp. turbine unit, reducing speed from 6,000 to 100 rpm. Gear turns slowly under welding machine as hub is welded to centerpiece at Westinghouse Sunnyvale works. After welding, rim of high-carbon steel will be hobbed into 693 helical teeth of 0.0001-in. tolerance.—Steel, Mar 7, p126

Triple Coating Process Protects Aluminum Surface

Triple surface protection has been developed by Sam Tour & Co. for severe drawing of aluminum alloys. Three coats are chemical, plastic, and extreme-pressure (E-P) lubricant.

Chemical coating procedure is to rinse annealed parts in water, clean in Dexodine solution by 4-min. immersion at 70-80° F., dip in 50:50 nitric acid solution, water rinse, and dip for 2 min. in Alodine solution at 120° F. Dexodine and Alodine are products of American Chemical Paint Co.

After rinsing, parts are lacquer coated by brush or dip with a nitrocellulose lacquer. Parts are dried and coated with E-P lubricant. The triple protection is remarkably tough and durable. It has been used with 24S, 52S, 61S, and 75S alloys.—Iron Age, Mar 10 p106

Photographs Aid in Hiring

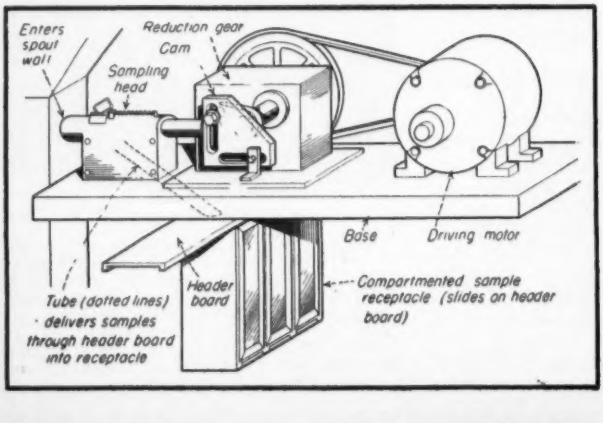
The industrial-relations department of Hand Knit Hosiery Co. has photographed the 50–60 operations in its plant and uses the 5 x 7-in. prints to advantage in describing jobs and job requirements to applicants. The pictures have proved much more accurate than words and ge tures; trips into the plant previous disrupted production.

Aside from giving the applicant a be ter idea of the work, the photograp have been helpful in improving pla housekeeping, as they point up poor co ditions and spot faulty equipment. The also show applicant what type of clothi to wear on the job.—Factory, Mar, p78

Factory Floated on Gumbo

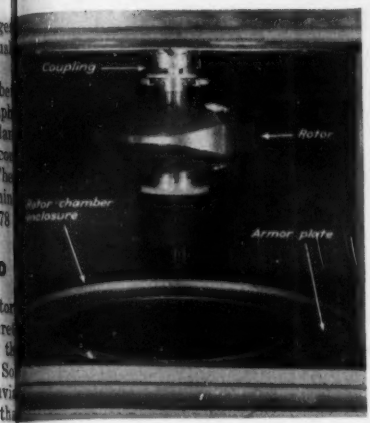
Sunshine Biscuits, Inc., new multi-sto plant was floated on reinforced concre flat slab when bearing tests showed t soil would take only light pressures. So down to a depth of 16 ft. was an alluvi deposit of fine clay, silt, and sand th cracked when dry. Plant consisted of 5-story, a 3-story, a 2-story, and a 1-sto section.

To eliminate expense of many ind pendent footings, platform was designe as an inverted, 2-way flat slab of 3,00 psi. concrete. Drop panels and colum capitals were omitted to carry colum loads to slab. Loads run to 735,000 l Under full load, average pressure on s under 5-story section was 1,600 psf. under 3-story section, 1,010 psf.; and u der 2-story section, 770 psf.—Eng New Rec, Mar 3, p45.



DEVICE SAMPLES DRY MATERIALS

Dry, flowing materials —wheat, flour, corn meal, dried milk—are readily sampled by this unit. Samples are obtained from chute and left by slotted plunger sliding in spout tube. Material drops into cup-like slot in end of plunger and is drawn back far enough to drop into delivery tube to receptacle. — Food Ind, Mar, p105



SUPER-SPEED CENTRIFUGE

ntrifuge, made by Specialized Instruments rp., exerts forces 260,000 times gravity th speeds to 70,000 rpm. Rotor carries cell and dummy for counterbalance, and ates in high vacuum. Rotor chamber is nor-plated in case of rotor explosion and rigerated for materials unstable at room mperature. Centrifuge is intended for re-arch on purification and molecular-weight termination.—Prod Eng, Feb, p92

uilding Ribs Store Air

machine shop in Houston, Texas, is rved with compressed air by using ilding ribs as storage space. The ructure is made of two Quonset huts d a center section, all supported on in. tubing instead of conventional struc-ral shapes.

The tubing supports were joined into ansverse bents or frames, joints were elded to pressure specifications, and e walls included within welds were t out to provide clear channels for air w. Adequate drains are provided on ertical columns to remove water.

When air is desired at any point in the op, a collar is welded on the nearest lumn, the tubing tapped under pres-re, and a hose attached.—Weld Eng, ar, p40

Production Increased 50% With 25% Less Handling

A study of materials-handling methods leading to a new procedure at Servel, Inc., has resulted in a 50% increase in production with materials-handling crews reduced 25%. Three problems were noted in the study: hand loading and stacking had to be reduced; handling distances were long; efficient scheduling was necessary to maintain an even flow of materials through the 2,000,000-sq. ft. plant.

The roving superintendent is furnished a power scooter and spends all his time directing movements on the floor. He is responsible for maintenance of all 29 pieces of equipment. Dispatcher records all "move" orders, listing type of materials to be moved, location, and destination, and dispatches the equipment best suited to make the move. "Deadheading" on return trip has been eliminated.

Some units are assigned to regular handling schedules operating from six designated pickup areas. Slips placed in the containers identify part number, quantity, location, and destination. The driver assigned to the route is responsible for keeping area supplied with empty containers.—Factory, Mar, p72

Restore Nutritional Values with Natural Substances

If need for fortification or restoration of nutritional values to food is indicated, two questions arise: (1) What concentrate contains the missing factor and (2) how can it be introduced?

If vitamins A and D are needed, fish-liver oils, irradiated ergosterol, or irradiated yeast and carotene should be considered. B complex vitamins can be replaced by yeast, liver, cereal germ, rice-bran concentrates. Vitamin C is replaceable by synthetic ascorbic acid. High-quality protein can be added to food in the form of yeast, liver, soya flour, pea-

nut flour, dried skim milk, or dried egg.

Incorporating the concentrates in the food may be done in various ways—mixing, sprinkling, and spraying. If tastes and texture of the food are not acceptable, either amount or kind of additive should be changed.

Although fortifying with synthetic vitamins is generally cheaper, the nutritional improvement from natural substances is usually greater. Also, there is always a chance of a new, improved flavor or improved stability from natural substances.—Food Ind, Mar, p77

Concrete Mat Flood Dikes

Articulated concrete mattresses have proved most dependable as dike covering along the Mississippi River. Last year 14,000,000 sq. ft. of the mattress was placed by the Corps of Engineers, both as subaqueous mattress and upper-bank pavement. Reinforcing fabric and connections are non-corrosive and serve the joint function. Mattress slabs of 10 sq. ft. are manufactured at the site and are placed on banks from barges.—Con Meth, Mar, p42

Highlights of ECA's First Year

April 1948

President Truman signs the Foreign Assistance Act of 1948 (ECA law); Paul G. Hoffman appointed Administrator for Economic Cooperation . . . First recovery purchase authorized under European Recovery Program—$21-million worth of food, fuel, and other essential commodities for Austria, France, Greece, Italy, and the Netherlands . . . OEEC (Organization for European Economic Cooperation) set up in Paris for ERP countries.

May 1948

Recovery funds tentatively allotted to 11 ERP countries for April-June quarter. . . First authorization used for "offshore purchases" in eastern Europe—23,000 tons of coal from Poland for Austria.

June 1948

Italy signs first bilateral agreement under ECA with U. S. . . . Shipping cost of relief packages reduced 4c per lb. through ECA subsidy of ocean freight charges.

July 1948

OEEC council adopts general outlines of intra-European payments plan. . . ERP trade union advisory committee meets in London.

August 1948

OEEC invites members to submit plans for four-year recovery program. . . ECA procurement authorizations cross billion-dollar mark.

September 1948

Anglo-American council of productivity established. . . ECA announces 6.4-billion lire of Trieste counterpart funds for reconstruction of key industries. . . . First purchase agreement signed for strategic materials—26,000 tons of rubber from the U. K. stockpile.

October 1948

OEEC presents first annual program to U. S. special representative W. Averell Harriman; intra-European payments plan signed. . . . First investment guaranty—in amount of $850,000—for carbon-black plant in the U. K.

November 1948

ECA makes $837-million of loans to 11 ERP countries. Biggest loan: $310-million to the U. K.; France, $170-million; the Netherlands, $95-million. . . Procurement authorizations top $3-billion.

December 1948

Nine ERP countries abolish requirement for passport visas. . . . First "informational media" guaranty goes to New York Herald Tribune.

January 1949

Uncovered dollar deficit of ERP countries at end of recovery period expected to be between $1- and $3-billion. . . . Humphrey committee report on German reparations sent to U. S. State Dept.

February 1949

ECA submits requests for ERP's second year to Congress: asks approximately $4.3-billion for fiscal year June 1, 1949-July 30, 1950. . . Approximately $4-million of palm oil bought for U. S. supply of strategic materials, chiefly with the Netherlands and Indonesian counterpart funds. . . . U. K. gets additional loan of $3-million, bringing total ECA loans to $313-million.

March 1949

Supplementary loan agreements signed with the Netherlands, France, Denmark, Italy, and Ireland. Total loans exceed $900-million. . . . Senate Foreign Relations Committee unanimously approves $5,580-million of funds for 15 months of ERP—from April 1949 through June 1950. . . British steel founders arrive in U. S. to study industrial methods under ECA's technical assistance program.

Europe's Recovery Increasing; Plan's Extension Assured

— Report to Management —

"EUROPEAN RECOVERY, under Marshall Plan, goes before the United States Congress, for extension for a second year, many questions are in the minds of recipient nations . . . their people . . . their industrialists.

Has the program been a success or a failure in its first year? What will grants this year? Will there be major changes in the program during the coming year? How will private trading fare? Loans? Offshore purchases? What has been the progress of industrial recovery in Europe?

Some of these questions—what will ERP cost—have already been fairly well answered by Congress. In other instances, such as industrial recovery, the answer is a matter of record.

What Will Be Plan's Success

But that still leaves a number of other questions which are neither in the record nor reasonably clear at this time. One of these is the final success of the program—whether it will leave western Europe with a large dollar deficit or a small, manageable one. Another is whether the North Atlantic Pact, backed up with arms, will finally overcome the fear of security that has tended to slow Marshall Plan recovery in Europe.

Regardless of the answers to these questions, the second installment, for European recovery will cost less than the first year.

In the 12 months ended March 31, 1949, the United States gave and loaned western Europe $5,055-million, a rate of about $421,000,000 a month. Between April 1 and June 30 spending will be at a rate of $383,000,000 a month. For the fiscal year beginning July 1, spending will average $357,000,000 a month.

Since the recovery program is now being planned on a July 1-June 30 annual basis, how does the cost of the second fiscal year compare with the first? The answer is down. In terms of annual totals, the drop is from $4,824-million to $4,280-million, or 11%.

Cut May Reach $500-Million

The drop may turn out to be even larger. The $4,280-million is the Economic Cooperation Administration's own estimate of what the second fiscal year will take. And while it has been approved by the U. S. Senate's Foreign Relations Committee, chances are good that this amount will be cut by perhaps as much as $500-million when it is brought before the Congress for discussion and passage. However, it is unlikely that Congress will change the general spending as scheduled by ECA.

Not all of the $4,280-million for next year will be in the form of grants; a portion of it will be in loans. In some cases, loans rather than grants will comprise the major part—or all—of the dollar aid in the coming fiscal year. However, total loans in 1949–50 are unlikely to get much above $200-million.

This is in sharp contrast to the current fiscal year when loans will total near-

European recovery has passed from the relief stage to the rehabilitation stage. Allocations for the 1949-50 fiscal year will be weighted heavily in favor of industrial machinery—last year emphasis was on foodstuffs. Program allocations for the coming fiscal year may be reduced slightly.—The McGraw-Hill Washington Bureau.

ly $975-million, or about one-fifth of all ERP help.

Reason for the prospective drop in loans is that most of the big countries are already "loaned up." Besides, Congress has now swung around to the belief that much of the $975-million of the fiscal-year loans constituted "forced lending," hence were unwarranted.

ECA head Hoffman's position is that ERP itself holds the answer to how right or wrong those first-year loans may be. To illustrate the point, if the recovery program gets a solar-plexus blow—like war—then we may as well forget about repayment. But if ERP goes according to plan, roughly as it has gone up to now, then they can be considered perfectly good loans.

The Senate Foreign Relations Committee has already made it clear that it would be unwise to set a fixed amount for loans as was done last year, when the target was $1-billion including U. S. investment guarantees.

However, look for the World Bank to supplement whatever loans ECA does make in 1949–50 with some lending of its own. Candidates include Turkey, Belgium, Norway, and the Netherlands.

DOLLAR BREAKDOWN

Here is ECA's dollar breakdown of ERP in the fiscal year 1949-1950, together with percentage changes from the current annual program:

Countries	Fiscal Year 1949–50	% Change from Current Fiscal Year
Austria	$197	−8
Belgium-Luxembourg & Belgian D.O.T	200	−19
Denmark	109	*
France & D.O.T.	875	−11
Germany-Bizone	404	−2
Germany-French Zone	115	+16
Greece	170	+17
Iceland	7	+35
Ireland	64	−18
Italy	555	*
Netherlands & D.O.T.	355	−24
Norway	105	+26
Portugal	10	**
Sweden	54	+16
Trieste	12	−33
Turkey	30	−24
United Kingdom	940	−24
Program Funds	$4,202	−12
Non-program funds (administration, technical assistance, strategic-material projects, ocean freight on relief packages, etc.)	78	+16
Total	$4,280	−11

*—Decline is less than 1%

**—Portugal is not receiving any dollar aid in the current fiscal year.

D.O.T.—Dependent Overseas Territories.

Swing to Recovery Goods

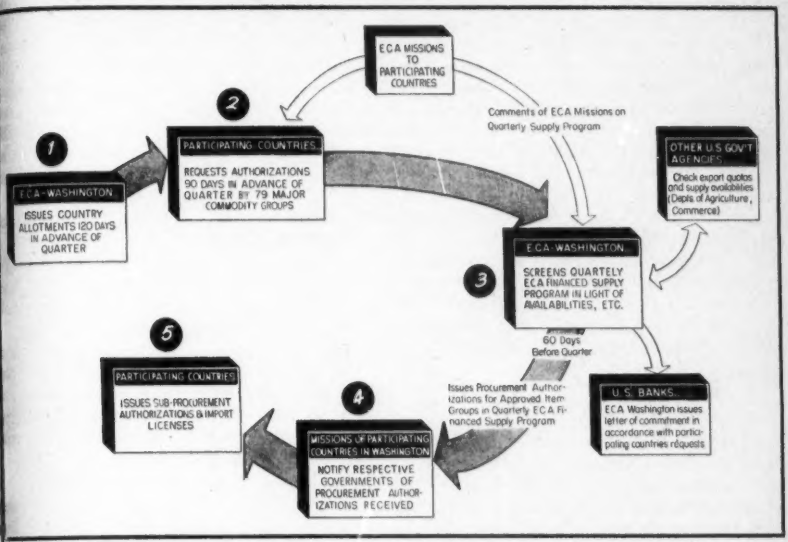
In the first 12 months of the recovery program, ECA authorized some $5-billion of spending by western European countries. Slightly under half this figure was used to buy and transport food and agricultural commodities. The remainder was used to buy and ship industrial commodities.

In the early days of the program, purchase authorizations issued by ECA were almost all for food, fuel, fibers, and fertilizer; there was little or no buying of industrial raw materials and production machinery.

Thus, in the first three months of the program (April-June 1948), 60% of all authorizations were for purchases of farm products and 40% for industrial goods, of which less than 2% was for machinery. Now the proportions are reversed; farm products account for about 40% of fall buying authorizations, and industrial goods 60%—of which fully a third is for machinery.

More than three-fifths of all ERP buying in the first 12 months was placed

ECA Quarterly Program Procedure


ECA MISSIONS TO PARTICIPATING COUNTRIES
Comments of ECA Missions on Quarterly Supply Program
1
ECA-WASHINGTON
ISSUES COUNTRY ALLOTMENTS 120 DAYS IN ADVANCE OF QUARTER
2
PARTICIPATING COUNTRIES
REQUESTS AUTHORIZATIONS 90 DAYS IN ADVANCE OF QUARTER BY 79 MAJOR COMMODITY GROUPS
OTHER U.S. GOV'T AGENCIES
Check export quotas and supply availabilities (Depts. of Agriculture, Commerce)
3
ECA-WASHINGTON
SCREENS QUARTELY ECA FINANCED SUPPLY PROGRAM IN LIGHT OF AVAILABILITIES, ETC.
60 Days Before Quarter
Issues Procurement Authorizations for Approved Item Groups in Quarterly ECA Financed Supply Program
U.S. BANKS
ECA Washington issues letter of commitment in accordance with participating countries requests
4
MISSIONS OF PARTICIPATING COUNTRIES IN WASHINGTON
NOTIFY RESPECTIVE GOVERNMENTS OF PROCUREMENT AUTHORIZATIONS RECEIVED
5
PARTICIPATING COUNTRIES
ISSUES SUB-PROCUREMENT AUTHORIZATIONS & IMPORT LICENSES

the U. S. Here is how purchases ran percentage-wise by areas:

United States	64%
Canada	16%
Latin America	9%
Participating countries	5%
Other countries	6%

With the notable exception of grain, the bulk of ECA-financed buying has been through private trade channels. In the first 12 months of operation, more than 80% of all purchases were handled through businessmen abroad buying from businessmen in the U. S. Less than 20% was in government-to-government procurement.

Until Congress comes up with final figures for fiscal 1949–50, the composition of west Europe's ECA-financed imports can only be determined in a general way. Briefly, the big push in next year's program will be in machinery and industrial raw materials. Also, offshore purchases will be sharply lower.

Principal reason for this is the Marshall Plan countries are now exporting an increasing amount of goods to other areas of the world, especially Canada and Latin America. Also, participating countries are paying lower prices, resulting in lower dollar deficits.

As an example, last year western Europe fell about $1.7-billion short of covering its dollar deficits with Canada and Latin America. In 1949–50, the deficit with these areas is expected to be only $890-million, a reduction of 45%.

How Financing Is Done

ECA itself does not do any buying, either on its own account or as an agent for participating countries. Rather it is the financing agency for European recovery. There are four methods of financing— reimbursement, letter of commitment, drafts on ECA, and government-to-government.

In the case of reimbursement, for ex-

ample, France lays out its own dollars for purchases and is later repaid by ECA.

Letters of commitment may be issued by either a U. S. bank or supplier. In the first instance, the U. K., Italy, or any other participating country requests ECA to issue a letter to a U. S. bank selected by the country. This represents an undertaking by the recovery agency to reimburse the bank for payments made by it for commodities and services furnished. France leads the list in this method of financing. In the second instance, the letter of commitment is issued to the supplier of ECA-financed goods or services. It is issued mainly for purchases of industrial equipment, especially where progress payments are involved.

Financing by Draft

Drafts on ECA represent a relatively new financing procedure. Like the letter of commitment, this method enables a participating country to buy commodities or services without using its own dollars. It introduces use of a revolving fund account which the recovery agency establishes for the country on the books of the U. S. Treasury Department. The country can then draw drafts on ECA against such an account.

In the case of government-to-government procurement, ECA advances funds to the U. S. buying agency to cover cost of an authorized purchase. ECA then receives reports of completed transactions. Wheat, coal, petroleum, and medical supplies have been largely financed in this manner.

The background for Marshall Plan financing is programming—scheduling out in advance the food, the raw materials, and the machinery that the participating countries are authorized to buy.

During the first six months of its life, the recovery agency in Washington and OEEC (Organization for European Economic Cooperation) in Paris perfected programming procedures. Further changes may be made in scheduling methods, but they will not be very different from the present system.

Basically, ECA programming is both on a quarterly and a long-range basis.

In quarterly programming (see chart p65), ERP countries are informed of their dollar allotment four months ahead of each quarter, with buying program set up three months in advance. After reviewing the quarterly lists, ECA in Washington issues procurement authorizations and the countries may begin buying two months ahead of the quarter.

Long-range programming (see p67) consists of three major stages:

(1) Preparation by OEEC of questionnaires and instructions for each of the 19 member nations or areas; (2) formulation of individual country programs; and (3) final examination and revision of national programs by OEEC to consolidate the program.

As indicated in the second diagram, details of each program are discussed with the office of the special representative (roving ambassador) in Paris and the various ECA missions. This assures mutually acceptable programs and a close screening by the top recovery officers in Washington.

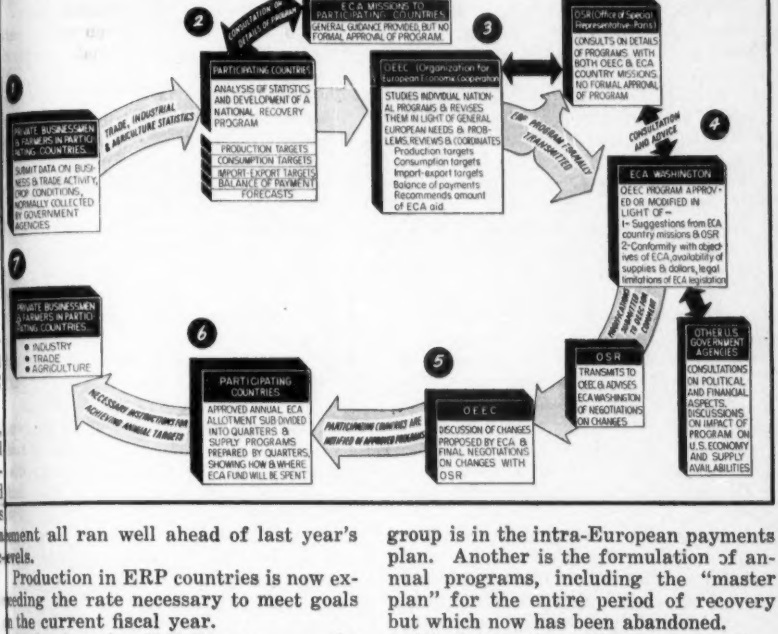
The Outstanding Achievements

In two important respects the Marshall Plan has thus far been an outstanding success: by giving new hope to the democratic nations of Europe last year, it turned the tide of communism; and it has generated a strong physical recovery in Western Europe. (See p62.)

The first achievement does not lend itself to statistical measurement but the second does.

In the closing quarter of 1948, industrial output in Marshall Plan Europe was 13% ahead of the like period of 1947 and 5% ahead of 1938. Steel set the production pace, with output in the last three quarters of 1948 at an annual rate of 43-million metric tons—25% ahead of the last quarter of 1947. Production of coal, textiles, electric power, and

ECA Long-Range Program Procedure


1
PRIVATE BUSINESSMEN & FARMERS IN PARTICIPATING COUNTRIES
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ment all ran well ahead of last year's levels.

Production in ERP countries is now exceeding the rate necessary to meet goals in the current fiscal year.

Goals for the 1949–50 year are the stiffest yet. Here is a comparison of this year as against last year in seven major industries (1935–38=100):

Industry	Goal 1948–49	Goal 1949–50
Coal consumption	95	100
Textile production	99	108
Finished steel consumption	100	110
Crude steel output.....	102	115
Machinery production ...	115	125
Refined oil consumption ..	160	169
Electricity output	166	180

Other notable accomplishments of ERP in its first 12 months include:

(1) Establishment of the 19-nation OEEC, the Marshall Plan's principal instrument of mutual aid. One major example of practical cooperation by this group is in the intra-European payments plan. Another is the formulation of annual programs, including the "master plan" for the entire period of recovery but which now has been abandoned.

(2) Putting into effect reconstruction-development-debt retirement programs in France, the U. K., Trieste, Greece, Italy, and Norway with counterpart funds.

(3) Exchange of technical assistance. To help ERP nations get more effective results from their own resources and from ECA-financed goods, American methods and techniques are available to member countries.

(4) Stimulation of east-west trade. Through "offshore purchases," ECA has helped expand the traditional trade between Marshall Plan countries and eastern European nations.

ECA has promoted travel in western Europe; absorbed ocean freight cost on relief packages; and set up a close liaison

with the U. N. Economic Commission for Europe at Geneva.

Most important factor to all this is the trade deficits of the ERP nations are narrowing. As an indication, in 1947 western Europe's exports were sufficient to pay for only 40% of its imports. In the 1948–49 fiscal year, exports will pay for 50% of the imports; and in the 1949–50 fiscal year, probably 60%.

Where does ERP go from here?

In the first year of operation, ERP has succeeded in breaking the back of Europe's production problems. Next job is to break the financial problem.

Most European currencies are definitely over-valued, thus restricting trade. Countries are still relying heavily on bilateral agreements—barter deals. In turn, they are forced to lean more heavily than they otherwise would on imports from dollar countries. It is for this reason that coal surpluses are appearing in Europe while Marshall Plan countries are still getting ECA-financed coal.

Setting up on the intra-European payments plan, which provides a method of multi-lateral clearances, is a significant step toward restoration of convertible currencies. But it is only a step. Fundamental changes remain to be put into effect. Administrator Hoffman places the currency problem at the top of the list of things OEEC countries must do.

Necessary Steps

Here are the steps Hoffman says western Europe must take:

(1) Expand exports by increasing productivity per man-hour, lowering prices, and improving marketing techniques.

(2) Make "much greater" efforts to develop at home—and in other areas—new sources of supply for those imports which ERP countries cannot afford to buy in dollars.

(3) Push the development of intra-European trade—by building customs unions, modifying immigration barriers, and breaking tariff bottlenecks.

(4) Exchange full information on investment plans so that investors can make decisions in the light of all facts.

(5) Curtail non-essential imports even further so as to forestall the danger of drastic reductions when ERP ends.

ERP Disappointments

The original act provided that the administrator should facilitate the transfer of hard-to-get minerals and materials vital to the U. S. nation defense. So far ECA has closed contracts for only about 20% of what was hoped for.

One stumbling block, according to officials, is that Marshall Plan countries want the assurance of continued markets before they undertake necessary investments to increase production. That involves offering long-term contracts.

The guarantee program has been another disappointment. Under the original law, up to $300-million was made available for stimulating private U. S. investments in ERP countries. The idea was to guarantee the convertibility of profits and capital up to the dollar amount put into approved projects abroad.

Big reason for the lag, says ECA, is that American businessmen have plenty of investment opportunities in the U. S. Another reason: European countries fear that if they don't approve U. S. industrial projects, they will get the money as a loan anyway.

Three facts are obvious as the European Recovery Act nears the end of its first year. The program will be continued for a second year, although the appropriation may be slightly reduced. The plan, during its first year, has met with enthusiastic reception within the United States—the program has gotten off to an auspicious start. And the emphasis of the program has shifted from one of relief to one of rehabilitation—the eventual goal of the Marshall Plan—as represented by the shift in percentages of allocations from foodstuffs to machinery.

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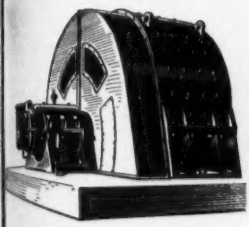

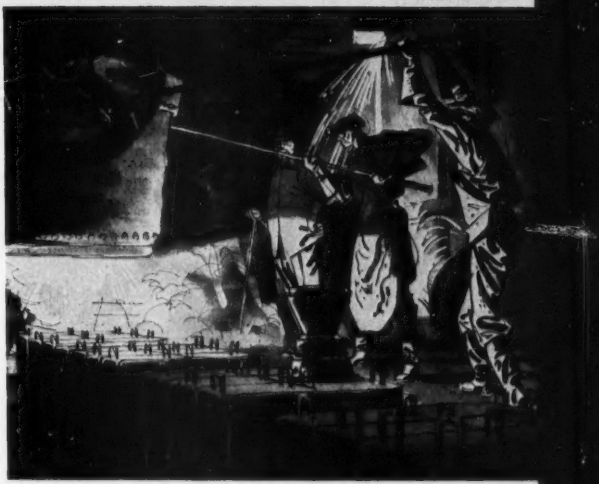

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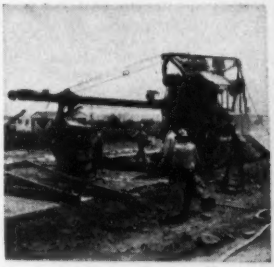

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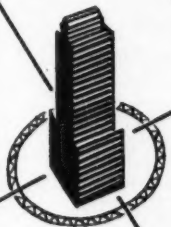

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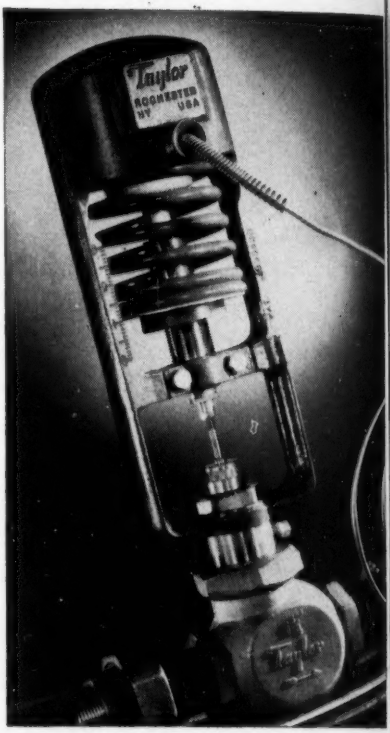

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Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

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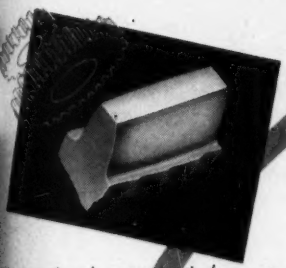

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- increases their factor of safety
- reduces gear noise
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Conventional gear teeth (spur or helical) can be expected to behave as they should theoretically only on the drafting board. When they are made of steel and assembled in a power unit, it is a rare accident when bearing is uniform across the entire faces of any two mating teeth. In nearly every case, bearing is concentrated at one end of the tooth or the other where it is most vulnerable to failure.

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